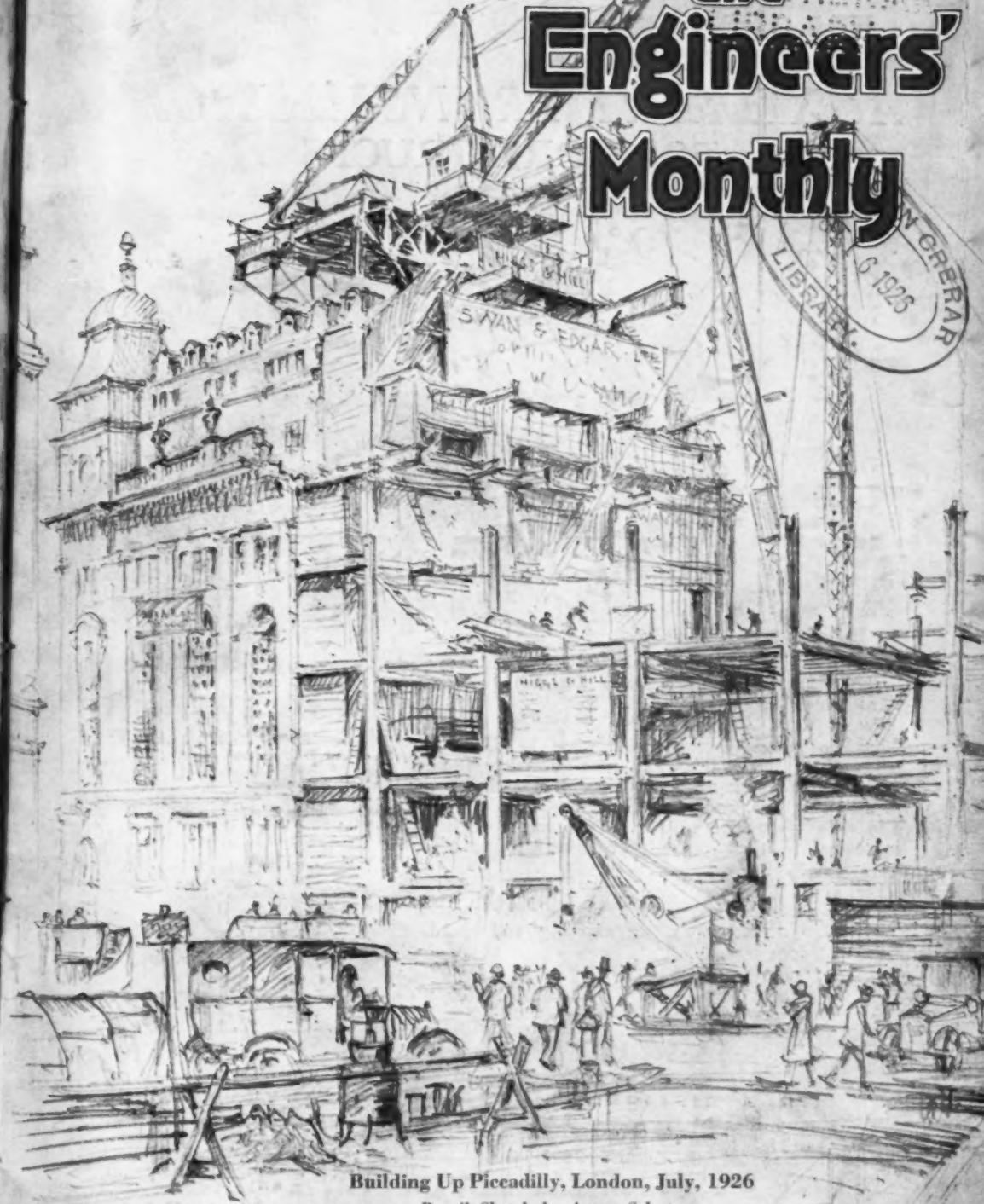


OCTOBER, 1926
25 Cents \$1 a Year

Contractors' and Engineers' Monthly

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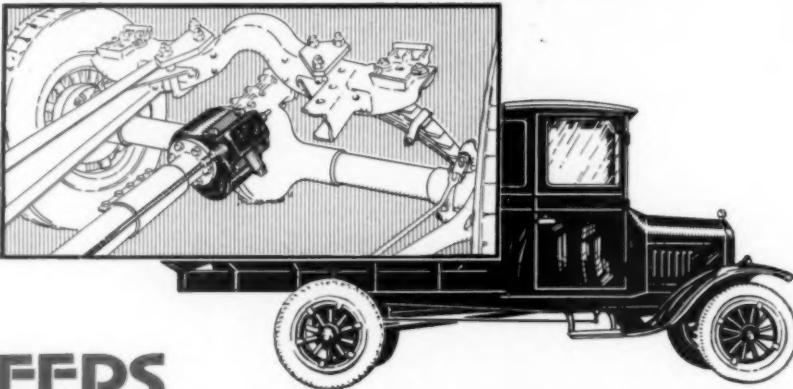


Building Up Piccadilly, London, July, 1926

Pencil Sketch by Anton Schutz

MADE SO WHOL...

THE FULLER AUXILIARY TRANSMISSION FOR FORD TRUCKS



KEEPS THAT LINE OF STEEL UNBROKEN

On that sturdy line of steel connecting foot brake and rear wheels depends the safety of the Ford Truck and its driver.

That line of steel is kept unbroken when the FULLER is installed, because this unit has no neutral position. Its speed change is as fast and positive as the snap of a light switch, and the driver can shift with confidence, going uphill or down. To become stranded in neutral, with foot-brake inoperative, is impossible.

There's profit as well as satisfaction in using a device which safeguards both truck and driver, while effectually increasing hauling capacity and speed.

FULLER FEATURES

Four Speeds Forward—Two Reverse.
No Neutral Position (Ford Brakes Always Available).
No Added Strain on Motor, Universal Joint, or Drive Shaft.
No Rebuilding Necessary; No Cutting of Drive Shaft.
Installation, 2 to 3 Hours; No Special Tools Needed.
Very Simple and Easy to Operate.
Built by Fuller; Largest Manufacturers of Truck and Bus Transmissions in the World.
Fully Guaranteed for 90 Days Against All Defects.

PRICE \$60⁰⁰ F. O. B.
FACTORY
West of the Rockies, \$5.00 Additional

FULLER & SONS MFG., CO.
KALAMAZOO MICHIGAN
TRANSMISSION BUILDERS FOR 23 YEARS

Where to Purchase

A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment. The Index to Advertisers faces the inside back cover. When writing to advertisers please mention the CONTRACTORS' & ENGINEERS' MONTHLY. A star (*) before the manufacturer's name indicates that his advertisement appears in this issue.

This index is published as an aid to the reader, but the publishers assume no responsibility for errors or omissions.

AERIAL WIRE ROPE TEAMWAYS

Amer. Steel & Wire Co., Chicago
Broderick & Bascom Rope Co., St. Louis
A. Leachen & Sons Rope Co., St. Louis

AIR COMPRESSORS

*American Steam Pump Co., Battle Creek, Mich.
*Barnes Mfg. Co., Mansfield, O.
*Buhl Co., Chicago.
Curtis Pn. Mch. Co., St. Louis, Mo.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Ingersoll-Rand Co., N. Y.
*Nove Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Schramm, Inc., West Chester, Pa.
*Stevens Mfg. & Eng. Co., Freeport, Ill.
*Sullivan Mch. Co., Chicago
Allis-Chalmers Mfg. Co., Milwaukee.
Chicago Pneumatic Tool Co., N. Y.
De Laval Stm. Turb. Co., Trenton, N. J.
Fairbanks, Morse & Co., Chicago.
Gardner Governor Co., Quincy, Ill.
General Elec. Co., Schenectady, N. Y.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Independent Pneum. Tool Co., Chicago
Nordberg Mfg. Co., Milwaukee.
Norwalk Ir. Wks. Co., So. Norwalk, Ct.
United Iron Wks., Kans. City, Mo.
Westinghouse Trac. Brake Co., Wilmerding, Pa.
Worthington Pump & Mch. Corp., N. Y.

ARC LAMPS

General Elec. Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co.,
E. Pittsburgh, Pa.

ARTESIAN WELL DRILLS & PUMPS

*Ingersoll-Rand Co., New York
Am. Well Works, Aurora, Ill.

ASBESTOS PRODUCTS

*Philip Carey Co., Cincinnati.
Kesabey & Mattison Co., Ambler, Pa.
Mikesell Bros. Co., Wabash, Ind.
Norristown Mag. & Asb. Co., Norristown, Pa.
Sall Mountain Co., Chicago.

ASH HANDLING MACHINERY

*Bay City Dredge Wks., Bay City, Mich.
*Byers Mach. Co., Ravenna, O.
Chicago Automatic Conv. Co., Chicago
*Geo. Haiss Mfg. Co., N. Y.
*Mack Trucks, Inc., N. Y.
*Mead-Morrison Mfg. Co., E. Boston, Mass.
*Lakewood Eng. Co., Cleveland, O.
*Orton Crane & Shovel Co., Chicago
*Jas. E. Seavers Co., Chicago
C. O. Barlett & Snow Co., Cleveland, O.

Brown Hoisting Mach. Co., Cleveland, O.

Chain Belt Co., Milwaukee, Wis.
Gifford-Wood Co., Hudson, N. Y.
Green Eng. Co., E. Chicago, Ind.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago.
Portable Mach. Co., Passaic, N. J.
Robins Conv. Belt Co., N. Y.
Webster Mfg. Co., Chicago.
Weller Mfg. Co., Chicago.

ASPHALT

*Barber Asphalt Co., Philadelphia.
*Barrett Co., N. Y.
*Ky. Rock Asphalt Co., Louisville, Ky.
*Standard Oil Co. (Ind.), Chicago.
*Texas Co., N. Y.
*Warren Bros. Co., Boston.
Atlantic Ref. & Asphalt Corp., Phila.
Gulf Refining Co., Pittsburgh
Headley Good Roads Co., Phila.
New Orleans Ref. Co., New Orleans.
Pioneer Asphalt Co., Lawrenceville, Ill.
Sinclair Ref. Co., Chicago.
Standard Oil Co. of Cal., S. Francisco.
Standard Oil Co. of La., N. Orleans.
Standard Oil Co. of N. J., Newark.
Standard Oil Co. of N. Y., N. Y.

ASPHALT BLOCK

Hastings Pavement Co., N. Y.

ASPHALT CUTTERS

*Ingersoll-Rand Co., N. Y.
*Sullivan Machinery Co., Chicago.
Chicago Pneumatic Tool Co., N. Y.
Cleveland Rock Drill Co., Cleveland, O.
Dayton Pneum. Tool Co., Dayton, O.
Independent Pn. Tool Co., Aurora, Ill.

ASPHALT KETTLES (See Kettles for Asphalt and Tar Heating)

ASPHALT PLANTS, TOOLS, ETC.

*Aeroil Burner Co., Union Hill, N. J.
*Barber Asphalt Co., Philadelphia.
*Chausse Oil Burner Co., Elkhart, Ind.
*Littleford Bros., Cincinnati, O.
*Warren Bros. Co., Boston.
Edw. R. Bacon Co., S. Francisco.
Chase & Lyman, Boston.
F. D. Cummer & Son Co., Cleveland, O.
J. D. Farasey Co., Cleveland, O.
Hetherington & Berner, Indianapolis.
Mosher Mfg. Co., Chicago, Ill.

ASPHALT ROLLERS (See Road Rollers)

*Aeroil Burner Co., Union Hill, N. J.
*Barber Asphalt Co., Philadelphia.
*Chausse Oil Burner Co., Goshen, Ind.
*Equitable Asp. Maint. Co., Kan. C., Mo.
*Hauck Mfg. Co., B'klyn, N. Y.

BACKFILLERS

*Am. Gem. Mch. Co., Inc., Keokuk, Ia.
*Baker Mfg. Co., Springfield, Ill.
*Bay City Dredge Wks., Bay City, Mich.
*Buckeye Trac. Ditcher Co., Findlay, O.
*Byers Machine Co., Ravenna, O.
*Harnischfeger Corp., Milwaukee, Wis.
*Koehring Co., Milwaukee, Wis.
*Miami Trailer-Scraper Co., Troy, O.
*Orton Crane & Shovel Co., Chicago.
*Speeder Mch. Corp., Fairfield, Ia.
Austin Mach. Corp., Muskegon, Mich.
Construction Mch. Co., Waterloo, Ia.
Ersted Mch. Mfg. Co., Portland, Ore.
Lessman Loader Mfg. Co., Des Moines
Partners Co., Newton, Ia.
Weller Mfg. Co., Chicago.

BAR BENDERS AND CUTTERS

*Koehring Co., Milwaukee, Wis.
*Ransome Conc. Mch. Co., Dunellen, N. J.
Buffalo Forge Co., Buffalo, N. Y.
Concrete Steel Co., N. Y.
Electric Welding Co., Pittsburgh.
D. A. Hinman & Co., Sandwich, Ill.
J. L. Gleason & Co., Boston, Mass.
McKenna Co., Cleveland, O.

BAR CHAIRS, PIZZINFORING

*Truscon Stee. Co., Youngstown, O.
Concrete Stee. Co., N. Y.
Universal Form Clamp Co., Chicago

BAR TIERS

*Eates Valve Bag Co., Chicago.

BATCH BOXES

*Eaton Car & Const'n Co., Easton, Pa.
*Heitzel Stl. Form & Ir. Co., Warren, O.
*Lakewood Eng. Co., Cleveland, O.
*Jas. B. Seavers Co., Chicago
Eaton Car & Const'n Co. of Mo.,
Kansas City, Mo.
Western Wheeled Scraper Co., Aurora, Ill.

BEARING

Fafnir Bearing Co., New Britain, Conn.
Hyatt Roller Bear. Co., Harrison, N. J.
New Departure Mfg. Co., Bristol, Conn.
Timken Roller Bearing Co., Canton, O.

BINS, STORAGE

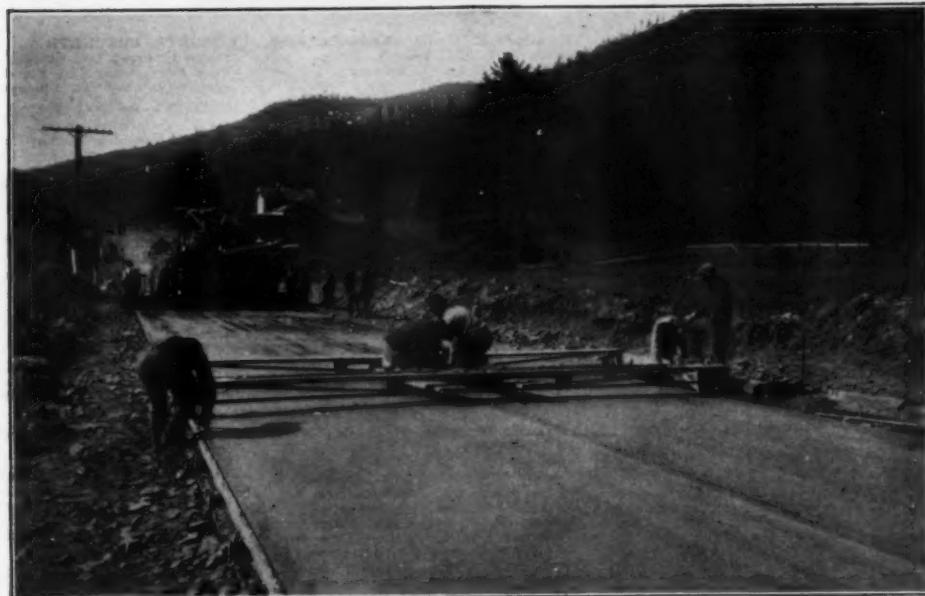
*Atlas Eng. Co., Milwaukee, Wis.
*Austin-Western Ed. Mach. Co., Chicago.
*Blaw-Knox Co., Pittsburgh, Pa.
*Eaton Car & Const'n Co., Easton, Pa.
*Erie Steel Const. Co., Erie, Pa.
*Galloway Iron Wks. & Mfg. Co., Galloway, O.
*Good Roads Mch. Co., Kennett Sq., Pa.
*Heitzel Stl. Form & Ir. Co., Warren, O.
*Ransome Conc. Mch. Co., Dunellen, N. J.
*Russell Grader Mfg. Co., Minneapolis.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS' & ENGINEERS' MONTHLY

Where to Purchase

- JAS. H. SEAVENS CO., Chicago**
UNIVERSAL RD. MACH. CO., KINGSTON, N. Y.
 Austin Mfg. Co., Chicago.
BIRMINGHAM TANK CO., Birmingham, Ala.
 Brown Hoisting Mch'y. Co., Cleveland.
 Fairfield Eng. Co., Marion, O.
 Link-Belt Co., Chicago.
 Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 Weller Mfg. Co., Chicago.
- BLAST HOLE DRILLING MACHINES**
 (See "Well Drilling and Blast Hole Machines")
- BLASTING POWDER** (See Explosives)
- BLOCKS AND TACKLE**
 *Boston & Lockport Blk. Co., E. Boston, Mass.
 *Dobbs Fdry. & Mach. Co., Niagara Falls, N. Y.
 *Western Block Co., Lockport, N. Y.
 Upson-Walton Co., Cleveland, O.
- BLUE PRINT MACHINES**
 Paragon Mach. Co., Rochester, N. Y.
 C. F. Pease Co., Chicago.
 Wickes Bros., Saginaw, Mich.
- BOILERS**
 *S. Flory Mfg. Co., Bangor, Pa.
 Johnston Bros. Inc., Petersburg, Mich.
 Chandler & Taylor Co., Indianapolis.
 Chatta. Boiler & Tank Co., Chatta., Tenn.
 R. D. Cole Mfg. Co., Newnan, Ga.
 Erie City Iron Wks., Erie, Pa.
 Hartley Blr. Wks., Montgomery, Ala.
 Helme Boiler Co., St. Louis, Mo.
 E. Keefer Co., Williamsport, Pa.
 Ladd Water Tube Blr. Co., Pittsburgh, Pa.
 V. Leffel & Co., Springfield, O.
 Lord & Burnham Co., Irvington, N. Y.
 Murray Iron Wks. Co., Burlington, Ia.
 Nagle Eng. & Blr. Wks., Erie, Pa.
 New Bern Iron Wks. & Sup. Co., New Bern, N. C.
 Petroleum Iron Wks. Co., Sharon, Pa.
 J. S. Schofield's Sons Co., Macon, Ga.
 Stanwood Corp., Cincinnati, O.
 Superior Body Corp., Marion, Ind.
 Traylor Eng. & Mfg. Co., Allentown, Pa.
 Vail & Murdock Co., Charleston, S. C.
 Vogt Mch'y. Co., Inc., Louisville, Ky.
 Walsh & Weidner Blr. Co., Chattanooga, Tenn.
- BRACES, TRENCH**
 Jas. H. Channing Mfg. Co., Chicago.
 Duff Mfg. Co., Pittsburgh, Pa.
 Kalamazoo Fdry. & Mach. Co., Kalamazoo, Mich.
 Waldo Bros. & Bond Co., Boston.
- BRANDING TOOLS**
 *Everett Mfg. Co., Maywood, Ill.
- BRASS GOODS**
 *Union Water Meter Co., Worcester, Mass.
 Glander Brass Mfg. Co., Cleveland, O.
 Haydenville Co., Haydenville, Mass.
 Hays Mfg. Co., Erie, Pa.
 Mueller Company, Decatur, Ill.
 United Brass Mfg. Co., Cleveland, O.
- BREAKERS, CONCRETE**
 *Buckeye Trac. Ditcher Co., Findlay, O.
 Hardsooc Wonder Drill Co., Ottumwa, Ia.
 *Ingersoll-Rand Co., N. Y.
 Chicago Pneumatic Tool Co., N. Y.
 Cleveland Rock Drill Co., Cleveland, O.
- BRICK, PAVING** (See Paving Brick)
- BRIDGES AND BUILDINGS, STEEL**
 *Blaw-Knox Co., Pittsburgh, Pa.
 Russell Grader Mfg. Co., Minneapolis.
 *Frederick Snare Corporation, N. Y.
 Amer. Bridge Co., N. Y.
 Bellefontaine Br. & Stl. Co., Bellfontaine, O.
 Belmont Iron Wks., Phila.
- BERLIN CONSTR. CO., BERLIN, CONN.**
 Bethlehem Steel Co., Bethlehem, Pa.
 Boston Bridge Wks., Boston.
 Central States Br. Co., Ind'polis, Ind.
 Champion Bridge Co., Wilmington, O.
 Chesapeake Ir. Wks., Baltimore, Md.
 Chicago Br. & I. Wks., Chicago.
 Clinton Bridge Wks., Clinton, Ia.
 Eastern Bridge & Struc. Co., Worcester, Mass.
 Flour City Orn. Iron Co., Minneapolis.
 Fort Pitt Br. Wks., Pittsburgh, Pa.
 Ingalls Ir. Wks. Co., Birmingham, Ala.
 Inter. Stl. & Ir. Co., Evansville, Ind.
 Louisville Br. & Ir. Co., Louisville, Ky.
 McClinic Marshall Co., Pittsburgh, Pa.
 Milwaukee Br. Co., Milwaukee, Wis.
 Minn. Stl. & Mch'y. Co., Minneapolis.
 Missouri Vt. Br. & Ir. Co., Leavenworth, Kan.
 Morava Constr. Co., Chicago.
 Mt. Vernon Br. Co., Mt. Vernon, O.
 Penn. Bridge Co., Beaver Falls, Pa.
 Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa.
 Richmond Struc. Stl. Co., Richmond, Va.
 Riverside Br. Co., Martins Ferry, O.
 Virginia Br. & Ir. Co., Roanoke, Va.
 Wisc. Br. & Ir. Co., No. Milwaukee, Wis.
- BRONZE TABLETS**
 Flour City Orn. Ir. Co., Minneapolis.
 Imperial Brass Mfg. Co., Chicago.
 J. L. Mott Iron Wks., N. Y.
- BROOMS** (See Street Sweeping Brooms)
- BUCKETS, AUTOMATIC DUMPING**
 *Lakewood Eng. Co., Cleveland, O.
 *Littleford Bros., Cincinnati, O.
 *Union Iron Wks., Inc., Hoboken, N. J.
 G. L. Stenbner Ir. Wks., Inc., Long Island City, N. Y.
- BUCKETS, CLAM SHELL**
 *Blaw-Knox Co., Pittsburgh, Pa.
 *Erie Steel Constr'n Co., Erie, Pa.
 *Geo. Haiss Mfg. Co., N. Y.
 *J. F. Kiesler Co., Chicago.
 *Lakewood Eng. Co., Cleveland, O.
 *Mead-Morrison Mfg. Co., E. Boston, Mass.
 *Orton Crane & Shovel Co., Chicago.
 Brown Hoisting Mach. Co., Cleveland, O.
 Browning Crane Co., Cleveland, O.
 F. A. Coleman Co., Cleveland, O.
 Hayward Co., N. Y.
 Industrial Wks., Bay City, Mich.
 Link-Belt Co., Chicago.
 McMyler Interstate Co., Cleveland, O.
 Owen Bucket Co., Cleveland, O.
 G. H. Williams Co., Erie, Pa.
- BUCKETS, CONCRETE**
 *Inslay Mfg. Co., Indianapolis, Ind.
 *Koppel Ind. Car & Equip. Co., Koppel, Pa.
 *Lakewood Eng. Co., Cleveland, O.
 *Ransome Conc. Mch'y. Co., Dunellen, N. J.
 *Union Iron Works, Inc., Hoboken, N. J.
 G. L. Stenbner Ir. Wks., Inc., Long Island City, N. Y.
- BUCKETS, DRAGLINE**
 *Dobbs Fdry. & Mch'y. Co., Niagara Falls, N. Y.
 *Gallen Ir. Wks. & Mfg. Co., Gallon, O.
 *Russel Grader Mfg. Co., Minneapolis.
 *Sauerman Bros., Chicago.
 Am. Mfg. & Eng. Co., Kalamazoo, Mich.
 Page Eng. Co., Chicago.
 Pioneer Bucket Co., Indianapolis, Ind.
 Schofield-Burkett Constr'n Co., Macon, Ga.
- BUCKETS, DREDGING AND EXCAVATING**
 *Blaw-Knox Co., Pittsburgh, Pa.
 *Geo. Haiss Mfg. Co., N. Y.
 *J. F. Kiesler Co., Chicago.
 *Lakewood Eng. Co., Cleveland, O.
 *Mead-Morrison Mfg. Co., E. Boston, Mass.
- BUCKETS, ORANGE PEEL**
 *J. F. Kiesler Co., Chicago.
 *Mead-Morrison Mfg. Co., E. Boston, Mass.
 *Orton Crane & Shovel Co., Chicago.
 Hayward Co., N. Y.
 Owen Bucket Co., Cleveland, O.
 G. H. Williams Co., Erie, Pa.
- BUILDINGS, STEEL** (See Bridges)
- BUNKS AND COTS**
 Ft. Pitt Bedding Co., Pittsburgh, Pa.
 Haggard & Marcuson Co., Chicago.
 Southern Home Co., Baltimore, Md.
- CABLES** (See Wire and Cables)
- CABLEWAY, DRAGLINE**
 *Mead-Morrison Mfg. Co., E. Boston, Mass.
 *Russel Grader Mfg. Co., Minneapolis.
 *Sauerman Bros., Chicago.
 *Street Bros. Mach. Wks., Chattanooga.
 Schofield-Burkett Constr'n Co., Macon, Ga.
- CABS FOR MOTOR TRUCKS**
 Highland Body Mfg. Co., Cincinnati, O.
 Weatherproof Body Corp., Corunna, Mich.
- CAISONS**
 American Bridge Co., N. Y.
 Birmingham Tank Co., Birmingham, Ala.
 Foundation Co., N. Y.
 Bethlehem Steel Co., Bethlehem, Pa.
 O'Rourke Eng. Constr. Co., N. Y.
 Petroleum Ir. Wks. Co., Sharon, Pa.
- CALCIUM CHLORIDE FOR ROADS**
 *Dow Chemical Co., Midland, Mich.
 *Solvay Process Co., Syracuse, N. Y.
 Carbondale Calcium Co., Carbondale, Pa.
- CANS FOR GARBAGE AND REFUSE**
 American Can Co., N. Y.
 Butler Mfg. Co., Minneapolis.
 Economy Baler Co., Ann Arbor, Mich.
 Rochester Can Co., Rochester, N. Y.
 Solar-Sturges Mfg. Co., Chicago.
 Steel Basket Co., Cedar Rapids, Ia.
- CAR UNLOADERS** (See "Loaders")
- CARS, INDUSTRIAL V. DUMPING**
 *Easton Car & Const. Co., Easton, Pa.
 *Inslay Mfg. Co., Indianapolis, Ind.
 *Koppel Ind. Car & Equip. Co., Koppel, Pa.
 *Lakewood Eng. Co., Cleveland, O.
 Atlas Car & Mfg. Co., Cleveland, O.
 Austin Mach. Corp., Muskegon, Mich.
 Chase Fdry. & Mfg. Co., Columbus, O.
 G. L. Stenbner Ir. Wks., Inc., Long Island City, N. Y.
 G. W. Hunt Co., W. New Brighton, N. Y.
 United Ir. Wks., Inc., Kansas City, Mo.
 Weller Mfg. Co., Chicago.
 Whiting Corp., Harvey, Ill.
- CARTS, CONCRETE**
 *Akron Barrow Co., Cleveland, O.
 *Easton Car & Const. Co., Easton, Pa.
 *Inslay Mfg. Co., Indianapolis, Ind.
 *Jackson Mfg. Co., Harrisburg, Pa.
 *Lakewood Eng. Co., Cleveland, O.
 *Lansing Co., Lansing, Mich.
 *Littleford Bros., Cincinnati, O.
 *Ransome Conc. Mch'y. Co., Dunellen, N. J.
 *T. L. Smith Co., Milwaukee.
 *Toledo Wheelbarrow Co., Toledo, O.
 Chattanooga Wheelbarrow Co., Chattanooga, Tenn.
 Cleveland Wheelbarrow Co., Cleveland, O.
 E. D. Etnyre & Co., Oregon, Ia.
 Gray Iron Fdry. Co., Reading, Pa.
 Lee Trailer & Body Co., Chicago.
 Sterling Wheelbarrow Co., Milwaukee.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*



Permanent Roads

Truscon Products for reinforcing concrete roads and pavements add materially to their life and cut down maintenance cost.

Truscon Wire Mesh, the permanent building steel—more economical than additional thicknesses of concrete. Truscon Contracting Joints to prevent the formation of irregular cracks. Truscon Rib Bars for reinforcement. Truscon Curb Bars for protection. Truscon Road Forms for speed and economy of construction.

See our exhibit, American Road Show in Chicago, January, 1927.

**TRUSCON STEEL COMPANY,
YOUNGSTOWN, OHIO**

Warehouses and Offices in all Principal Cities.

TRUSCON
HIGHWAY PRODUCTS

Where to Purchase

CAST IRON PIPE (See Pipe, Cast Iron)

CASTINGS, STREET AND SEWER

*Burch Flow Wks. Co., Crestline, O.
*Galion Ir. Wks. & Mfg. Co., Galion, O.
*U. S. Cast Ir. Pipe & Fdry. Co., Bur-

lington, N. J.

Caston Fdry. & Mach. Co., Canton, O.

Casey-Hedges Co., Chattanooga, Tenn.

Central Fdry. Co., N. Y.

J. B. Clow & Sons, Chicago.

W. E. Dee Co., Chicago.

Elkhart Fdry. & Mach. Co., Elkhart, Ind.

Foundry Mfg. Co., St. Albans, Vt.

Gilbert Mfg. Co., Aberdeen, S. Dak.

Klauser Mfg. Co., Dubuque, Ia.

Madison Fdry. Co., Cleveland, O.

Pechstein Iron Works, Keokuk, Ia.

Portable Mach. Co., Passaic, N. J.

Sessions Foundry Co., Bristol, Conn.

South Bend Fdry. Co., So. Bend, Ind.

CATCH BASINS (See Castings, Street)

CATCH BASIN CLEANING OUTFITS

*Mack Trucks, Inc., N. Y.

Elgin Sales Corp., N. Y.

Movakan Co., Indianapolis, Ind.

CAULKING MACHINERY AND TOOLS

*Ingersoll-Rand Co., N. Y.

Cleveland Rock Drill Co., Cleveland, O.

Helwig Mfg. Co., St. Paul, Minn.

Mueller Company, Decatur, Ill.

CEILINGS, METAL

Berger Mfg. Co., Canton, O.

Canton Art Metal Co., Canton, O.

Globe Iron Roofing & Cor. Co., Cincinnati, O.

Newport Rolling Mill Co., Newport, Ky.

Klauser Mfg. Co., Dubuque, Ia.

Geo. L. Mesker & Co., Evansville, Ind.

Milwaukee Corr. Co., Milwaukee.

Wheeling Corr. Co., Wheeling, W. Va.

CEMENT (P. C. stands for Portland Cement)

*Pennsylvania Cement Co., N. Y.

Acme Cement Corp., Catskill, N. Y.

Alma P. C. Co., Detroit, Mich.

Alabama P. C. Co., Birmingham, Ala.

Allentown P. C. Co., Allentown, Pa.

Alpha P. C. Co., Easton, Pa.

Ash Grove Lime and P. C. Co., Kansas City, Mo.

Atlas P. C. Co., N. Y.

Beaver P. C. Co., Portland, Ore.

Bessemer Limestone & C. Co., Youngstown, O.

British Col. Cement Co., Victoria, B. C.

Canada Cement Co., Ltd., Montreal, Canada.

Clinchfield P. C. Corp., Kingsport, Tenn.

Colorado P. C. Co., Denver, Colo.

Cowell P. C. Co., Cowell, Cal.

Crescent P. C. Co., Wampum, Pa.

Dewey P. C. Co., Kansas City, Mo.

Dexter P. C. Co., Nazareth, Pa.

Diamond P. C. Co., Cleveland, O.

Dixie P. C. Co., Chattanooga, Tenn.

Edison P. C. Co., N. Y.

Georgia Cement & Stone Co., Birmingham, Ala.

Giant P. C. Co., Philadelphia, Pa.

Glen Falls P. C. Co., Glen Falls, N. Y.

Golden State P. C. Co., Los Angeles, Cal.

Great West P. C. Co., Kans. City, Mo.

Hawkeye P. C. Co., Des Moines, Ia.

Hercules Cement Corp., Philadelphia.

Hermitage P. C. Co., Nashville, Tenn.
Huron P. C. Co., Detroit, Mich.
Indiana P. C. Co., Indianapolis, Ind.
International Cement Corp., N. Y.
International P. C. Co., Ltd., Spokane, Wash.

Kansas P. C. Co., Kansas City, Mo.

Knickerbocker P. C. Co., Inc., N. Y.

Kosmos P. C. Co., Louisville, Ky.

La Tolteca Compania de Cemento Port-

land, Mexico City, Mex.

Lawrence P. C. Co., Northampton, Pa.

Lehigh P. C. Co., Allentown, Pa.

Louisville Cement Co., Louisville, Ky.

Manitowoc P. C. Co., Manitowoc, Wis.

Marlboro Cement Co., Edmonton, Can.

Marquette Cement Mfg. Co., Chicago.

Missouri P. C. Co., St. Louis, Mo.

Monarch Cement Co., Humboldt, Kans.

Monolith P. C. Co., Los Angeles, Cal.

National Cement Co., Birmingham, Ala.

Nazareth Cement Co., Nazareth, Pa.

Nebraska Cement Co., Denver, Colo.

Newago P. C. Co., Newago, Mich.

New Egyptian P. C. Co., Detroit.

North Amer. Cement Corp., Albany, N. Y.

Northwestern States P. C. Co., Mason City, Ia.

Oklahoma P. C. Co., Denver.

Olympic P. C. Co., Ltd., Seattle.

Oregon P. C. Co., Portland, Ore.

Pacific P. C. Co., San Francisco.

Pearce P. C. Co., Union City, Mich.

Peninsular P. C. Co., Cement City, Mich.

Penn-Alan Cement Co., Allentown, Pa.

Petoskey P. C. Co., Petoskey, Mich.

Phoenix P. C. Co., Nazareth, Pa.

Pgb. Plate Glass Co., Pittsburgh, Pa.

Pyramid P. C. Co., Des Moines.

Riverside P. C. Co., Los Angeles.

St. Marys Cement Co., Toronto, Can.

San Antonio P. C. Co., San Antonio.

Sandusky Cement Co., Cleveland, O.

Santa Cruz P. C. Co., San Francisco.

Signal Mountain P. C. Co., Chatta, Tenn.

Southern States P. C. Co., Rockport, Ga.

Southwest P. C. Co., El Paso, Tex.

Sun P. C. Co., Portland, Ore.

Superior P. C. Co., Seattle, Wash.

Texas Forks P. C. Co., Dallas, Tex.

Three Forks P. C. Co., Denver, Colo.

Tidewater P. C. Co., Baltimore, Md.

Trinity P. C. Co., Dallas, Tex.

Union P. C. Co., Ogden, Utah.

U. S. P. C. Co., Denver, Colo.

Universal P. C. Co., Chicago.

Utah Idaho Cement Co., Ogden, Utah.

Vulcanite P. C. Co., Philadelphia.

Wabash P. C. Co., Detroit.

Wolverine P. C. Co., Coldwater, Mich.

Wyandotte P. C. Co., Detroit.

CEMENT BLOCK MACHINES

*Cement Block Mach. Co., Newark, N. J.

CEMENT GUNS

Cement Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories)

CEMENT TOOLS

*Abrasives Cement Tool Co., Detroit

CENTRIFUGAL PUMPS (See "Pumps, Centrifugal")

CHAINS

Amer. Chain Co., Inc., Bridgeport, Conn.

Chain Belt Co., Milwaukee, Wis.

Columbus McKinnon Chain Co., Columbus, O.

Diamond Chain & Mfg. Co., Indianapolis, Ind.

Jeffrey Mfg. Co., Columbus, O.

Link-Belt Co., Chicago.

Robins Conv. Belt Co., Passaic, N. J.

Webster Mfg. Co., Chicago.

Weller Mfg. Co., Chicago.

CHIMNEYS, CONCRETE

Heine Chimney Co., Chicago
Rust Engineering Co., Pittsburgh, Pa.
Weber Chimney Co., Chicago

CHIMNEYS, RADIAL BRICK

Amer. Chimney Corp., N. Y.
Alphonse Castodis Chimney Const. Co., N. Y.
Continental Chimney Co. of Chi., Chicago
Heine Chimney Co., Chicago
H. R. Heinicke, Inc., Indianapolis, Ind.
M. W. Kellogg & Co., N. Y.
Rust Eng. Co., Pittsburgh, Pa.

CHIMNEYS, STEEL (See Stacks, Steel)

CHLORINATORS

*Wallace & Tierman Co., Inc., Newark, N. J.

CHLORINE, LIQUID (See Liquid Chlorine)

CHUTES, CONCRETE

*Inley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, O.
*Ransome Concr. Mach. Co., Dunellen, N. J.

CLIPS, WIRE ROPE

Amer. Hoist & Derrick Co., St. Paul, Minn.
Fischer & Hayes Rope & Steel Co., Chicago

Thos. Langlin Co., Portland, Me.
Marion Malleable Iron Wks., Marion, Ind.
C. M. Mockbee & Co., Cincinnati, O.
John A. Roebling Sons Co., Trenton, N. J.
Upton-Walton Co., Cleveland, O.

CLUTCHES

*Twin Disc Clutch Co., Racine, Wis.
*Waukesha Motor Co., Waukesha, Wis.

COAL AND ORE CONVEYING MACHY.

*Barber-Greene Co., Aurora, Ill.
*Good Roads Machy. Co., Kennett Sq., Pa.
*Chicago Automatic Conv. Co., Chicago
*Geo. Haiss Mfg. Co., N. Y.
*Mead-Morrison Mfg. Co., E. Boston, Mass.
*Jas. B. Seavers Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, O.
Brown Hoisting Mch. Co., Cleveland, O.
Chain Belt Co., Milwaukee, Wis.
Fairfield Eng. Co., Marion, O.
Gifford-Wood Co., Hudson N. Y.
C. V. Hunt Co., Int., W. New Brighton, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., N. Y.
Link-Belt Co., Chicago.
Portable Machinery Co., Passaic, N. J.
Robins Conv. Belt Co., Passaic, N. J.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago.

COCKS, CURB AND CORPORATION

*Union Wtr. Mtr. Co., Worcester, Mass.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Glauber Brass Mfg. Co., Cleveland, O.
Haydenville Co., Haydenville, Mass.
Hayes Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.

COLLAPSIBLE HORSES

Taylor Collapsible Horse Co., Chicago

COLUMN CLAMPS

*Inley Mfg. Co., Indianapolis, Ind.
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
Victor L. Phillips Co., Kansas City, Mo.
Sterling Wheelbarrow Co., Milwaukee.
Symons Clamp & Mfg. Co., Chicago.
Universal Form Clamp Co., Chicago

COMPRESSORS, AIR (See Air Compressors)

CONCRETE BLOCK MACHINES (See Cement Block Machines)

CONCRETE FLOOR HARDENER

Anti-Hydro Waterproofing Co., Newark, N. J.

If you find any errors or omissions in this Where to Purchase list, please send corrections to
CONTRACTORS' & ENGINEERS' MONTHLY



**Big Output and
Reliability**

with Steam or Gas+Air ERIE

**"Gas+Air ERIE has more power for the tough digging—
and our operator likes it better every day."**

***"The ERIE is lowest in
upkeep cost"***

Every time a contractor writes that the ERIE has proved to be "lowest in upkeep cost," you have more evidence of the ERIE's unequalled reliability. For instance, this report:

"Our ERIE is working as a crane excavating for sewers and water mains; have also used this ERIE as a shovel on street grading. We are operating three different makes of machines, and the ERIE is the lowest in upkeep cost." B. F. Perry, E. & W. McShaffery Co., Akron, Ohio.

The B-2 ERIE "Dreadnaught" has even more strength and more power than past ERIES—owners tell us it is the best Steam ERIE ever built.



"We have used the Gas+Air ERIE on most of our work to test it. On three or four tough jobs we encountered pretty stiff shale rock—and in every instance we found the Gas+Air ERIE would develop more power and dig the material more rapidly. Our operator likes it better every day."—B. W. Ariss, Pres., Ariss-Knapp Co., Oakland, Calif.

Numerous REPEAT ORDERS are coming in from contractors who have found that this gas shovel *digests much more*.

It works with the speed of an ERIE Steam Shovel—and with exactly the same perfect control over the dipper.

Can dig harder materials: The full power of the big 4-cylinder gasoline engine, direct-connected for hoisting, can be used *at the same time* the direct-connected air engines are exerting full power for crowding and swinging.

It is reliable: No reversing frictions on the hoist, crowd or swing. All direct drive.

If your work calls for a gasoline shovel, it will pay you to go and see a Gas+Air ERIE at work on the job.

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago
Representatives throughout the U. S. A.

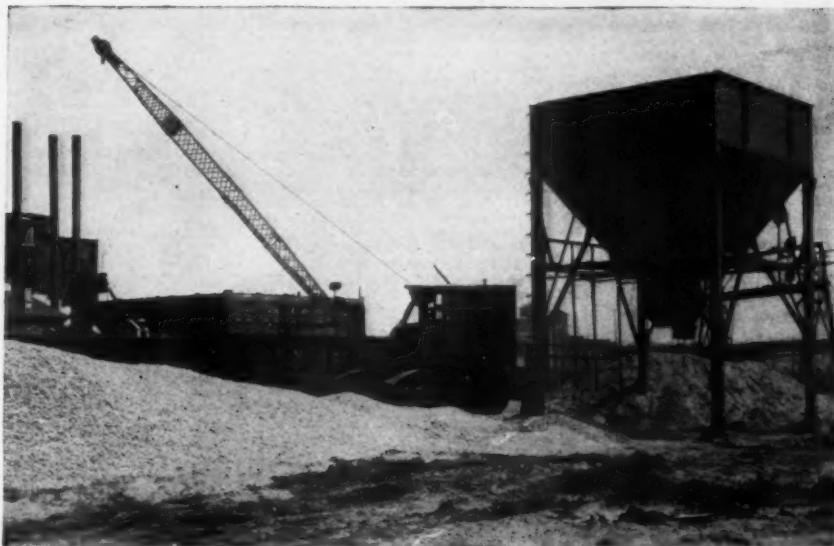
GAS+AIR and Steam **ERIE DREADNAUGHT**
SHOVELS, CRANES, DRAGLINES, TRENCH HOES, ETC.

Where to Purchase

8

- GENERAL CHEMICAL CO., N. Y.**
General Firepr. Co., Youngstown, O.
Granitex Corp., N. Y.
A. C. Horn Co., L. I. City, N. Y.
Master Builders Co., Cleveland, O.
L. Sonnenborn Sons, Inc., N. Y.
Truscon Laboratories, Detroit.
- CONCRETE HEATERS**
***Aerol Burner Co., Union Hill, N. J.**
***Chase Oil Burner Co., Elkhart, Ind.**
Hans Mfg. Co., Brooklyn, N. Y.
***Alex. Milburn Co., Baltimore, Md.**
- CONCRETE MIXERS**
***Amer. Con. Mchy. Co., Inc., Keokuk, Ia.**
***Atlas Eng. Co., Milwaukee, Wis.**
Kiel Mach. Co., Kiel, Wis.
Koehring Co., Milwaukee, Wis.
Lakewood Eng. Co., Cleveland, O.
Lansing Co., Lansing, Mich.
Hansome Con. Mchy. Co., Dunellen, N.J.
Schramm, Inc., West Chester, Pa.
***T. L. Smith Co., Milwaukee, Wis.**
***Standard Scale & Supply Co., Pittsburgh**
Badger Con. Mixer Co., Milwaukee
Chain Belt Co., Milwaukee
Construction Mchy. Co., Waterloo, Ia.
B. M. Cropp Co., Chicago
The Roots Co., Nunda, N. Y.
J. B. Roots Fdry. Co., Fredericktown, O.
Gray Iron Fdry. Co., Reading, Pa.
Jaeger Mach. Co., Columbus, O.
Judy Mfg. Co., Centerville, Ia.
Knickersbocker Co., Jackson, Mich.
Kwik-Mix Con. Mixer Co., Port Washington, Wis.
Leach Co., Oshkosh, Wis.
Marsh-Capron Co., Chicago
Milwaukee Cone. Mixer Co., Milwaukee, Ind.
Raber & Lang Mfg. Co., Kendallville, Ind.
Remmel Mfg. Co., Keweenaw, Wis.
Republic Ir. Wks., Tecumseh, Mich.
- CONCRETE PILING (See Piling)**
- CONCRETE PIPE (See Pipe, Concrete)**
- CONCRETE REINFORCEMENT**
***Truscon Steel Co., Youngstown, O.**
American Steel & Wire Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Concrete Steel Co., N. Y.
Consolidated Exp. Metal Co., Braddock, Pa.
Electric Welding Co., Pittsburgh, Pa.
Ft. Pitt Bridge Wks., Pittsburgh, Pa.
General Fireproofing Co., Youngstown, O.
Inland Steel Co., Chicago
Kalman Steel Co., Chicago
Laclede Steel Co., St. Louis, Mo.
National Steel Fabric Co., Pittsburgh
J. T. Ryerson & Son, Chicago
Wickwire-Spencer Steel Co., N. Y.
Youngstown Pressed Steel Co., Warren, O.
Youngstown Sheet & Tube Co., Youngstown, O.
- CONCRETE ROAD FINISHERS**
***Haltzel Stl. Form & Iron Co., Warren, O.**
Lakewood Eng. Co., Cleveland, O.
Dunn Road Mach. Co., Connell, O.
A. W. French & Co., Chicago
- CONCRETE SURFACING MACHINES**
***Concrete Surfacing Mchy. Corp., Cincinnati, O.**
W. H. Keller, Inc., Grand Haven, Mich.
- CONCRETE TOOLS**
***The Dallett Co., Philadelphia**
- CONDENSERS**
***Ingersoll-Rand Co., N. Y.**
Allis-Chalmers Mfg. Co., Milwaukee
Dean Bros. Co., Indianapolis, Ind.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wheeler Cond. & Eng. Co., Carteret, N.J.
Worthington Pump & Mchy Corp., N.Y.
- CONDUIT RODS**
F. Bissell Co., Toledo, O.
Turbine Sewer Mch. Co., Milwaukee
Waldo Bros. & Bond Co., Boston
- CONDUITS, UNDERGROUND**
Amer. Vitr. Products Co., Akron, O.
Johns-Manville Inc., N. Y.
National Fireproofing Co., N. Y.
Ric-Wil Co., Cleveland
- CONTRACTORS' EQUIPMENT DEALER**
ERA (See pages 150 to 175)
- CONVEYORS, BELT**
***Austin-Western Rd. Mchy. Co., Chicago**
***Barber-Greene Co., Aurora, Ill.**
***Chicago Automatic Conv. Co., Chicago**
***Galion Jr. Wks. & Mfg. Co., Galion, O.**
***Good Rds. Mchy. Co., Kennett Sq., Pa.**
***Geo. Haiss Mfg. Co., N. Y.**
Jas. Seavers Co., Chicago
***Russell Grader Mfg. Co., Minneapolis**
Brown Hoisting Mchy. Co., Cleveland
Chain Belt Co., Milwaukee
Gifford Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago
Samuel Olson & Co., Chicago
Portable Mchy Co., Passaic, N. J.
Robins Conv. Belt Co., N. Y.
Standard Conv. Co., No. St. Paul, Minn.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
- CONVEYORS, BUCKET**
***Atlas Eng. Co., Milwaukee**
***Chicago Automatic Conv. Co., Chicago**
***Good Rds. Mchy. Co., Kennett Sq., Pa.**
***Geo. Haiss Mfg. Co., N. Y.**
***Mead-Morrison Mfg. Co., Boston, Mass.**
***Russell Grader Mfg. Co., Minneapolis**
Jas. B. Seavers Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, O.
Brown Hoisting Mchy. Co., Cleveland, O.
H. W. Caldwell & Son, Chicago
Chain Belt Co., Milwaukee
Fairfield Eng. Co., Marion, O.
Gifford Wood Co., Hudson, N. Y.
Godfrey Conv. Co., Elkhart, Ind.
Guarantees Constr. Co., N. Y.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago
Samuel Olson & Co., Chicago
Republic Rubber Co., Youngstown, O.
Robins Conv. Belt Co., N. Y.
Stephens Adamson Mfg. Co., Aurora, Ill.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
- CONVEYORS, GRAVITY**
Lamson Co., Syracuse, N. Y.
Logan Co., Louisville, Ky.
Mathews Gravity Carrier Co., Elwood City, Pa.
Standard Conv. Co., No. St. Paul, Minn.
- COUPLINGS, HOSE**
***Ingersoll-Rand Co., N. Y.**
Cleveland Pneum. Tool Co., Cleveland, O.
Gliman Mfg. Co., East Boston, Mass.
W. H. Keller, Inc., Grand Haven, Mich.
- CRANES, LOCOMOTIVE**
***Bay City Dredge Wks., Bay City, Mich.**
***Byers Machine Co., Ravenna, O.**
Erie Steam Shovel Co., Erie, Pa.
Harnischfeger Corp., Milwaukee
Koehring Co., Milwaukee
***Orton Crane & Shovel Co., Chicago**
Jas. B. Seavers Co., Chicago
Amer. Hist. & Derrick Co., St. Paul, Minn.
Brown Hoisting Mchy. Co., Cleveland
Browning Crane Co., Cleveland, O.
Bucyrus Co., So. Milwaukee, Wis.
Davenport Locomotive Co., Davenport, Ia.
Hanna Eng. Works, Chicago
Industrial Wks., Bay City, Mich.
Link-Belt Co., Chicago
Loc. Crane Co. of Amer., Champaign, Ill.
Marion Steam Shovel Co., Marion, O.
McMyler Interstate Co., Cleveland, O.
Northwest Eng. Works, Chicago
- CRANES, OVERHEAD TRAVELING**
***Curtis Pneum. Mach. Co., St. Louis**
***Harnischfeger Corp., Milwaukee**
Alliance Mach. Co., Alliance, O.
Chesapeake Iron Wks., Baltimore, Md.
Chisholm-Moore Mfg. Co., Cleveland, O.
Milwaukee Elec. Crane Co., Milwaukee
Morgan Eng. Co., Alliance, O.
Northern Eng. Wks., Detroit, Mich.
Shaw Crane Wks., Muskegon, Mich.
Shepard Elec. Cr. & Hat. Co., Montour Falls, N. Y.
Toledo Crane Co., Bucyrus, O.
Whiting Fdry. & Equip. Co., Harvey, Ill.
- CRANES, TRUCK**
***Byers Machine Co., Ravenna, O.**
***Harnischfeger Corp., Milwaukee**
***Orton Crane & Shovel Co., Chicago**
Bo. City Fdry. & Mach. Co., Bay City, Mich.
Universal Crane Co., Cleveland
- CRANES, WRECKING**
Bucyrus Co., So. Milwaukee, Wis.
Industrial Wks., Bay City, Mich.
- CRAWLER ATTACHMENTS**
***Geo. Haiss Mfg. Co., New York**
- CREOSOTED BLOCKS, TIMBER, ETC.**
Amer. Creos. Co., Inc., Louisville, Ky.
Amer. Creos. Wks., Ind. N. Orleans, La.
Carter Bloxenend Flooring Co., K. City, Mo.
Colonial Cre. Co., Inc., Louisville, Ky.
Compressed Wood Preserving Co., Cincinnati, O.
Creos. Materials Co., N. Orleans, La.
Georgia Creos. Co., Louisville, Ky.
Jennison-Wright Co., Toledo, O.
Midland Creos. Co., Granite City, Ill.
Pensacola Creosoting Co., Pensacola, Fla.
Republic Creos. Co., Indianapolis, Ind.
Southern Wood Pres. Co., Atlanta, Ga.
Wyckoff Pipe & Creos. Co., N. Y.
- CREOSOTING AND CREOSOTING OILS**
***Barrett Co., N. Y.**
Amer. Creos. Wks. Inc., N. Orleans, La.
Am. Tar Prod. Co., Pittsburgh, Pa.
Jennison-Wright Co., Toledo, O.
Southern Creos. Co., Ltd., Slidell, La.
Southern Pavg. Const. Co., Chattanooga, Tenn.
Wyckoff Pipe & Creos. Co., N. Y.
- CRUSHERS, HEAVY DUTY**
Allis-Chalmers Mfg. Co., Milwaukee
O. G. Buchanan Co., N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.
- CRUSHERS, ROCK**
***Acme Ed. Mchy. Co., Frankfort, N. Y.**
***Austin-Western Rd. Mach. Co., Chicago**
***Galion Iron Wks. & Mfg. Co., Galion, O.**
***Good Rds. Mchy. Co., Kennett Sq., Pa.**
***Russell Grader Mfg. Co., Minneapolis**
***Smith Eng. Wks., Milwaukee**
***Universal Rd. Machy. Co., Kingston, N.Y.**
Morgan Eng. Co., Alliance, O.
New Holland Mach. Co., New Holland, Pa.
Starkeviant Mill Co., Boston
Universal Crusher Co., Cedar Rapids, Ia.
- CULVERTS, CAST IRON**
***Galon Jr. Wks. & Mfg. Co., Galion, O.**
***U. S. G. I. Pipe & Fdry. Co., Burlington, N. J.**
Amer. G. I. Pipe Co., Birmingham, Ala.
Gilbert Mfg. Co., Aberdeen, S. D.
R. D. Wood & Co., Philadelphia
- CULVERTS, CORRUGATED METAL**
***Austin-Western Rd. Mach. Co., Chicago**
***Galon Iron Wks. & Mfg. Co., Galion, O.**
***Good Rds. Mach. Co., Kennett Sq., Pa.**
***Newport Culvert Co., Newport, Ky.**
Bark River Bridge & Culv. Co., Bark River, Mich.
- BOARDMAN CO., OKLA. CITY, OKLA.**
Burnham Mfg. Co., Woods Cross, Utah
Calif. Corr. Culv. Co., W. Berkeley, Cal.

Indicates that the manufacturer carries an advertisement. See index facing inside back cover.



the car...the bin...the crane

Manufacturers of Gasoline, Steam and Electric Locomotive Cranes, Flexible Tread Cranes, Road Wheel Cranes, Gantry Cranes and Power Shovels.

Gasoline and Electric Truck Cranes, Rubber Tired Wheel Cranes, Clamshell Buckets, Orange Peel Buckets $\frac{1}{2}$ to 5 cubic yards capacity. Coal Crushers.

The car must be unloaded; the bin is empty; the trucks are idling and the mixer is waiting for a batch. Who says that the crane is not the most important factor in contracting equipment?

Every experienced road building contractor knows that when the crane is laid up for repairs the whole job is slowed down and sometimes it is impossible to proceed until the crane is in working condition.

Successful contractors guard against this by using the ORTON. They take no chances with "make-shift outfits" or "experiments" which are put on the market only to sell and not to give conscientious service. ORTONS have been working for contractors for nearly twenty years.

The ORTON Model "T" Gasoline Crane with its 35 to 40 ft. boom and $\frac{3}{4}$ yard clamshell is used universally by the largest road builders. It loads bins or hoppers up to a height of 30 ft.; shipped anywhere without dismantling a single part.

The Model "T" and its "side-kick" the Model "E" 1 yard crane are completely described and illustrated in our new bulletin No. 41 . . . send for your copy.

ORTON CRANE & SHOVEL CO., 608 S. Dearborn St., CHICAGO, ILLINOIS

Formerly ORTON & STEINBRENNER CO.



Where to Purchase

- Canada Ingot Ir. Co., Ltd., Guelph, Ont.
 Canton Culv. & Silo Co., Canton, O.
 Coast Culv. & Flume Co., Portland, Ore.
 Corr. Culv. Co., Moberly, Mo.
 Dixie Culv. & Metal Co., Atlanta, Ga.
 Dixie Culv. Mfg. Co., Little Rock, Ark.
 Fla. Metal Prod. Co., Jacksonville, Fla.
 Gilbert Mfg. Co., Aberdeen, S. D.
 R. Hardesty Mfg. Co., Denver, Colo.
 Highway Prod. & Mfg. Co., Elmira, N. Y.
 Ind. Corr. Culv. Co., Mason City, Ia.
 Iowa Pure Ir. Co., Des Moines, Ia.
 Klaes Mfg. Co., Dubuque, Ia.
 Lytle Culv. & Rd. Equip. Co., Minneapolis, Minn.
 Md. Culv. & Metal Co., Baltimore.
 N. E. Metal Culv. Co., Palmer, Mass.
 Nebraska Culv. & Mfg. Co., Wahoo, Neb.
 North East Metal Culv. Co., Nashua, N.H.
 Northfield Ir. Co., Northfield, Minn.
 Northw'rn Sheet & Ir. Wks., Wahpeton, N. D.
 Ohio Corr. Culv. Co., Middletown, O.
 W. Q. O' Neill Co., Crawfordsville, Ind.
 Road Supply & Metal Co., Topeka, Kan.
 Sioux Falls Metal Culv. Co., Sioux Falls, S. D.
 So. Metal Culv. Co., Salisbury, N. C.
 Spokane Culv. & Tank Co., Spokane.
 Tenn. Metal Culv. Co., Nashville.
 U. S. Br. & Culv. Co., Bay City, Mich.
 Va. Metal Mfg. Co., Roanoke, Va.
 Western Metal Mfg. Co., Houston, Tex.
 Wheeling Corr. Co., Wheeling, W. Va.
 Wyatt Metal & Blr. Wks., Dallas, Tex.
- CULVERT FORMS**
 Concrete Form Co., Inc., Syracuse, N.Y.
 Northfield Iron Co., Northfield, Minn.
- CURB BOXES**
 Casey-Hedges Co., Chattanooga, Tenn.
 H. W. Clark Co., Mattoon, Ill.
 J. B. Clow & Sons, Chicago.
 Madison Dry. Co., Cleveland, O.
 Mueller Co., Decatur, Ill.
- CURB, GUTTER AND BASE FORMS**
 (See "Forms, Concrete")
- CURB GUARDS, STEEL**
 *W. S. Godwin Co., Baltimore.
- CURE, STEEL PROTECTED**
 *Truscon Steel Co., Youngstown, O.
 Concrete Steel Co., N. Y.
- CURING OF CONCRETE**
 *Dow Chemical Co., Midland, Mich.
 *Solvay Process Co., N. Y.
- CUTTERS, PIPE, HAND**
 Armstrong Mfg. Co., Bridgeport, Ct.
 Barnes Tool Co., New Haven, Ct.
 Erie Tool Works, Erie, Pa.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 Oswego Tool Co., Oswego, N. Y.
 Reed Mfg. Co., Erie, Pa.
 Walworth Mfg. Co., Boston.
- CUTTERS, ROD AND WIRE**
 *Koehring Co., Milwaukee, Wis.
 Buffalo Forge Co., Buffalo, N. Y.
 Carolus Mfg. Co., Sterling, Ill.
 C. D. Edwards Mfg. Co., Albert Lea, Minn.
 Helwig Mfg. Co., St. Paul, Minn.
 Worthington Pump & Mchly Corp., N.Y.
- CUTTING EDGES**
 *Russell Grader Mfg. Co., Minneapolis
 J. D. Adams & Co., Indianapolis, Ind.
 Shank Mfg. Co., Bucyrus, O.
- CUTTING AND WELDING APPARATUS**
 *Alex. Milburn Co., Baltimore.
 MacLeod Co., Cincinnati, O.
- DERRICKS, GUY AND STIFF-LEG**
 *Clyde Ir. Wks. Sales Co., Duluth, Minn.
 *Dobbie Dry. & Mach. Co., Niagara Falls, N. Y.
- DERRICKS, PIPE LAYING**
 *Dobbie Dry. & Mach. Co., Niagara Falls
- DERRICKS, REVOLVING**
 *Clyde Iron Wks. Sales Co., Duluth, Minn.
 *Dobbie Dry. & Mach. Co., Niagara Falls
- DERRICKS, STEEL**
 *Clyde Ir. Wks. Sales Co., Duluth, Minn.
 *Dobbie Dry. & Mach. Co., Niagara Falls
- DERRICKS, STEEL PORTABLE**
 *Clyde Ir. Wks. Sales Co., Duluth, Minn.
 *Dobbie Dry. & Mach. Co., Niagara Falls
- DERRICKS, TRAVELING**
 *Bay City Dredge Wks., Bay City, Mich.
 *Clyde Ir. Wks. Sales Co., Duluth, Minn.
 *Dobbie Dry. & Mach. Co., Niagara Falls
- DERRICK FITTINGS**
 *S. Flory Mfg. Co., Bangor, Pa.
- DIESEL ENGINES (See Engines, Oil)**
- DISTRIBUTORS, TAR AND ASPHALT**
 Kinney Mfg. Co., Boston
- DISTRIBUTING PLANTS, CONCRETE**
 *Lakewood Eng. Co., Cleveland.
 *Insey Mfg. Co., Indianapolis, Ind.
- DITCHING MACHINES (See Excavators)**
- DIVIDING PLATES (ROAD)**
 *W. S. Godwin Co., Baltimore
- DOORS AND SHUTTERS, STEEL ROLLING**
 Cornell Iron Wks., B'klyn, N. Y.
 Kinnear Mfg. Co., Columbus, O.
 Variety Fire Door Co., Chicago.
 J. G. Wilson Corp., N. Y.
- DRAFTING MACHINES**
 Univ. Drafting Mach. Co., Cleveland, O.
- DREDGES**
 *Bay City Dredge Wks., Bay City, Mich.
 *Erie Steam Shovel Co., Erie, Pa.
 *Orton Crane & Shovel Co., Chicago
- DUMP BODIES FOR CONCRETE**
 *Eaton Car & Const'n Co., Easton, Pa.
 Lee Trailer & Body Co., Chicago
- DUMP BODIES FOR MOTOR TRUCKS**
 *Anthony Co., Streater, Ill.
 *Eaton Car & Const'n Co., Easton, Pa.
 *Heil Co., Milwaukee.
- DYERS, ASPHALT AND CEMENT**
 Allis-Chalmers Mfg. Co., Milwaukee.
 Amer. Blower Co., Detroit, Mich.
 Amer. Process Co., N. Y.
- DYERS, SAND AND GRAVEL**
 *Aeroil Burner Co., Union Hill, N. J.
 *Chausse Oil Burner Co., Elkhart, Ind.
 *Littleford Bros., Cincinnati, O.
- DYERS, STEEL BODY**
 *Alex. Milburn Co., Baltimore, Md.
 C. O. Bartlett & Snow Co., Cleveland, O.
 F. D. Cummer & Son Co., Cleveland, O.
 Mosher Mfg. Co., Chicago
 Ruggles-Cole Eng. Co., N. Y.
- DYERS, STEEL BODY**
 *Marion Steel Body Co., Marion, O.
 N. Y. Central Ir. Wks., Hagerstown, Md.
 *Stewart Iron Wks. Co., Cincinnati.
- DYERS, STEEL BODY**
 *Wood Hydr. Hoist & Body Co., Detroit
 Am. Truck & Body Co., Martinsville, Va.
 Archer Iron Wks., Chicago.
- DYERS, STEEL BODY**
 Columbia Body Corp., Columbia, Pa.

If you find any errors or omissions in this Where to Purchase list, please send corrections to
 CONTRACTORS' & ENGINEERS' MONTHLY



*How do your
batches turn out?*

If you are using "THE STANDARD" Mixer you are always assured of thorough, quick mixing.

"THE STANDARD" skip has an unusually wide mouth—takes its load easily—is quickly raised and empties cleanly at one shot—no fussing or tugging. The material is mixed in a narrow drum and is whirled, sifted and turned by the revolving blades quickly and thoroughly and is discharged through a large 16½-in. opening that permits the batch to be emptied quickly.

If you are interested in speeding up your mixes, and increasing your daily yardage—investigate "THE STANDARD"—it's the only 100 per cent Mixer on the market.

May we send you "THE STANDARD" Mixer Booklet?

"THE STANDARD" Concrete Mixers for LONG LIFE—DEPENDABLE SERVICE—EASY MOBILITY—QUICK LOADING—EASY DISCHARGE

THE STANDARD SCALE & SUPPLY CORPORATION

Pittsburgh

Penna.

New York
145 Chambers Street

Philadelphia
523 Arch Street

Cleveland
721 St. Clair Ave. N. E.

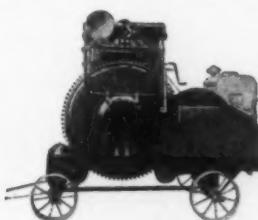
Chicago
1420 Michigan Blvd.

Sales Offices.



"The Standard" 5-S Power Loader
Mixer

Made in both Power Loader or Low Charger types. Used on short sidewalks and other similar operations where large volume is not a factor.



Two views of "The Standard" 7-S
Power Loader

Note unusually large discharge opening and non-obstructing charging skip.



Where to Purchase

Columbian St. Tank Co., Kansas City.
 Detroit Trailer & Mach. Co., Detroit.
 Ditzler Mfg. Co., Galion, O.
 Galion All Steel Body Co., Galion, O.
 Herron-Russell Co., N. Y.
 Herr Dump Car Mfg. Co., Coatesville, Pa.
 Hingee-Kearns Co., Mansfield, O.
 The Hug Co., Highland, Ill.
 Jennings Aut. Dump Body, Roanoke, Va.
 Lee Trailer & Body Co., Chicago.
 Mandt Body Co., Keokuk, Ia.
 Fechstein Iron Wks., Keokuk, Ia.
 Superior Body Corp'n, Marion, Ind.
 Van Dorn Iron Wks., Cleveland.

DUMP CARTS AND WAGONS, HORSE

*Acme Ed. Machy. Co., Frankfort, N. Y.
 *Austin-Western Ed. Machy. Co., Chicago.
 *Eagle Wagon Wks., Auburn, N. Y.
 *Le Plant-Chester Mfg. Co., Cedar Rapids, Ia.
 *Bax-Watson Corp., Canastota, N. Y.
 *Russell Grader Mfg. Co., Minneapolis.
 Acme Wagon Co., Elmigerville, Pa.
 Austin Mfg. Co., Chicago.
 Bain Wagon Co., Kenosha, Wis.
 Columbia Body Corp., Columbia, Pa.
 Gilbert Mfg. Co., Aberdeen, S. D.
 Hagg Wagon Co., Abingdon, Va.
 G. H. Halibut & Bro., Jeffersonville, Ind.
 Little Red Wagon Co., Omaha, Neb.
 Stockland Rd. Machy. Co., Minneapolis.
 Streich Bros., Oakosh, Wis.
 Thornhill Wagon Co., Lynchburg, Va.
 Western Wheeled Scraper Co., Aurora, Ill.

DUST LAYING (CALCIUM CHLORIDE)

*Dow Chemical Co., Midland, Mich.
 *Selby Process Co., N. Y.
 Carbondale Calcium Co., Carbondale, Pa.

DYNAMITE (See Explosives)

EJECTORS, SEWAGE (See Sewage Ejectors)

ELECTRIC GENERATORS AND MOTORS

Louis Allis Co., Milwaukee.
 Allis-Chalmers Mfg. Co., Milwaukee.
 Crocker-Wheeler Co., Ampere, N. J.
 Fairbanks, Morse & Co., Chicago.
 General Elec. Co., Schenectady, N. Y.
 Graybar Electric Co., New York.
 Ideal Elec. & Mfg. Co., Mansfield, O.
 Lincoln Elec. Co., Cleveland, O.
 Robbins & Myers Co., Springfield, O.
 Triumph Elec. Co., Cincinnati, O.
 Wagner Elec. Mfg. Co., St. Louis.
 Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LAMPS

General Elec. Co., Schenectady, N. Y.
 Westinghouse Lamp Co., N. Y.

ELECTRIC LIGHTING PLANTS

*Climax Eng. Co., Clinton, Ia.
 Allis-Chalmers Mfg. Co., Milwaukee.
 Cushman Motor Wks., Lincoln, Neb.
 Fairbanks, Morse & Co., Chicago.
 General Elec. Co., Schenectady, N. Y.
 Graybar Electric Co., New York.
 Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC TRANSFORMERS

Allis-Chalmers Mfg. Co., Milwaukee.
 General Elec. Co., Schenectady, N. Y.
 Kahlman Elec. Co., Bay City, Mich.
 Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC WIRES (See Wires)

ELEVATORS, BUCKET

*Allis Eng. Co., Milwaukee.
 *Austin-Western Ed. Machy. Co., Chicago.
 *Good Eds. Machy. Co., Kennett Sq., Pa.
 *Ho. Kains Mfg. Co., N. Y.
 *Littleford Bros., Cincinnati.
 *Russell Grader Mfg. Co., Minneapolis.
 *Spears-Wells Machy. Co., Oakland, Cal.

*Univ. Ed. Machy. Co., Kingston, N. Y.
 Austin Mfg. Co., Chicago.
 C. O. Bartlett & Snell Co., Cleveland, O.
 Brown Hatg. Machy. Co., Cleveland, O.
 Chain Belt Co., Milwaukee, Wis.
 Fairfield Eng. Co., Marion, Ohio
 Gifford-Wood Co., Hudson, N. Y.
 Jeffrey Mfg. Co., Columbus, O.
 Link-Belt Co., Chicago.
 Samuel Olson & Co., Chicago.
 Robbins Conv. Belt Co., N. Y.
 Webster Mfg. Co., Chicago.
 Weller Mfg. Co., Chicago.
 Worthington Pump & Mch. Corp., N.Y.

ELEVATORS, PASSENGER, FREIGHT, ETC.

Am. Elev. & Mach. Co., Louisville, Ky.
 Atlantic Elev. Co., Inc., Philadelphia.
 Bay State Elev. Co., Springfield, Mass.
 Haughton Elev. & Mach. Co., Toledo, O.
 Kaestner & Hecht Co., Chicago.
 Llewellyn Ir. Wks., Los Angeles, Cal.
 Montgomery Elev. Co., Moline, Ill.
 Otis Elevator Co., N. Y.
 O. Ridgway & Son Co., Coatesville, Pa.
 A. B. See Elec. Elev. Co., N. Y.
 Speidel Elev. Corp., Reading, Pa.
 Warner Elev. Mfg. Co., Cincinnati.
 Warsaw Elev. Co., Warsaw, N. Y.

ENGINES, GAS AND GASOLINE

*Alamo Eng. Co., Hillsdale, Mich.
 *Beaver Mfg. Co., Milwaukee, Wis.
 *C. H. & E. Mfg. Co., Milwaukee.
 *Caterpillar Tractor Co., San Leandro, Cal.
 *Climax Eng. Co., Clinton, Ia.
 *Continental Motors Corp., Detroit.
 *Domestic Eng. & Pump Co., Shippensburg, Pa.
 *Hercules Corp., Evansville, Ind.
 *Hercules Motors Corp., Canton, O.
 *Ingersoll-Rand Co., New York.
 *John Lanzon Mfg. Co., New Holstein, Wis.
 *Le Ro Co., Milwaukee.
 *Nevco Engine Co., Lansing, Mich.
 *Stover Mfg. & Eng. Co., Freeport, Ill.
 *Waukesha Motor Co., Waukesha, Wis.
 Allis-Chalmers Mfg. Co., Milwaukee.
 Buda Co., Harvey, Ill.
 Charter Gas Eng. Co., Sterling, Ill.
 Chicago Pneum. Tool Co., N. Y.
 Cook Motor Co., Delaware, O.
 Cushman Motor Wks., Lincoln, Neb.
 Evinrude Motor Co., Milwaukee.
 Fairbanks, Morse & Co., Chicago.
 Foss Gas Eng. Co., Springfield, O.
 Fuller & Johnson Mfg. Co., Madison, Wis.
 Gade Bros. Mfg. Co., Iowa Falls, Ia.
 Hinkley Motors, Inc., Detroit.
 Minneapolis Steel & Machy. Co., Minneapolis, Minn.
 Sanderson-Cyclone Drill Co., Orrville, O.
 Sterling Eng. Co., Buffalo, N. Y.
 Universal Motor Co., Oshkosh, Wis.
 Weber Engine Co., Kansas City, Mo.
 Wisconsin Motor Mfg. Co., Milwaukee.
 Worthington Pump & Mch. Corp., N.Y.

ENGINES, HOISTING (See Hoists)

ENGINES, KEROSENE

*Alamo Eng. Co., Hillsdale, Mich.
 *Climax Eng. Co., Clinton, Ia.
 *Stover Mfg. & Eng. Co., Freeport, Ill.
 *Waukesha Motor Co., Waukesha, Wis.

ENGINES, OIL

DIESEL

*Hoffeld-Penfield Steel Co., Bucyrus, O.
 Allis-Chalmers Mfg. Co., Milwaukee.
 Busch-Sulzer Bros. Diesel Eng. Co., St. Louis.
 Fulton Iron Wks. Co., St. Louis.
 McIntosh & Seymour Corp., Auburn, N.Y.
 Nordberg Mfg. Co., Milwaukee.
 St. Mary's Oil Eng. Co., St. Charles, Mo.
 Western Machy. Co., Los Angeles, Cal.

SEMI-DIESEL

*Ingersoll-Rand Co., N. Y.
 *Stover Mfg. & Eng. Co., Freeport, Ill.
 Anderson Dry. & Mach. Co., Anderson, Ind.

Ressemer Gas Eng. Co., Grove City, Pa.
 Buckeye Machinery Co., Lima, O.
 Charter Gas Eng. Co., Sterling, Ill.
 Chicago Pneum. Tool Co., N. Y.
 De La Vergne Mach. Co., N. Y.
 Fairbanks, Morse & Co., Chicago.
 Foss Gas Eng. Co., Springfield, O.
 Lombard Gov. Co., Ashland, Mass.
 Muncie Oil Eng. Co., Muncie, Ind.
 New London Ship & Eng. Co., Groton, Ct.
 Nordberg Mfg. Co., Milwaukee.
 Taylor Mach. Co., Cleveland, O.
 Weber Eng. Co., Kansas City, Mo.
 Worthington Pump & Mch. Corp., N.Y.

ENGINES, PUMPING

*Climax Eng. Co., Clinton, Ia.
 *Stover Mfg. & Eng. Co., Freeport, Ill.
 *Waukesha Motor Co., Waukesha, Wis.
 Allis-Chalmers Mfg. Co., Milwaukee.
 Hooven, Owens, Rentschler Co., Hamilton, O.
 Murray Iron Wks., Burlington, Ia.
 Nordberg Mfg. Co., Milwaukee.
 Worthington Pump & Mch. Corp., N.Y.

ENGINES, STEAM

*Ingersoll-Rand Co., New York.
 Allis-Chalmers Mfg. Co., Milwaukee.
 Dako Eng. Co., Grand Haven, Mich.
 Erie-Ball Eng. Co., Pittsburgh, Pa.
 Filer-Stowell Co., Milwaukee.
 Hardie-Tyne Mfg. Co., Birmingham, Ala.
 J. Leffel Co., Springfield, O.
 Morris Mach. Wks., Baldwinsville, N. Y.
 Murray Iron Works Co., Burlington, Ia.
 Nagle Eng. & Br. Wks., Erie, Pa.
 Nordberg Mfg. Co., Milwaukee.
 B. F. Sturtevant Co., Hyde Park, Boston.
 Vilter Mfg. Co., Milwaukee.

ENGINES, SWINGING

*Dake Eng. Co., Grand Haven, Mich.
 Lidgewood Mfg. Co., N. Y.

EXCAVATING MACHINERY (See Names Under Exc'tors, also Steam Shovels)

EXCAVATORS, CABLEWAY

*Street Bros. Mach. Co., Chattanooga.
 Amer. Mfg. & Eng. Co., Kalamazoo, Mich.
 Bucyrus Co., So. Milwaukee, Wis.
 Ersted Machy. Mfg. Co., Portland, Ore.
 Lidgewood Mfg. Co., N. Y.

EXCAVATORS, DITCH AND TRENCH

*Barber-Greene Co., Aurora, Ill.
 *Bay City Dredge Wks., Bay City, Mich.
 *Buckeye Trac. Ditcher Co., Findlay, O.
 *Evers Mach. Co., Ravenna, O.
 *Clyde Ir. Wks. Sales Co., Duluth, Minn.
 *Erie Steam Shovel Co., Erie, Pa.
 *Harnischfeger Corp., Milwaukee.
 *Inslay Mfg. Co., Indianapolis, Ind.
 *Keystone Driller Co., Beaver Falls, Pa.
 *Lidgewood Mfg. Co., N. Y.
 *Orton Crane & Shovel Co., Chicago.
 *Russell Grader Mfg. Co., Minneapolis.
 *Spoeber Machy. Corp., Fairfield, Ia.
 *Street Bros. Mach. Co., Chattanooga.
 American Hst. & Derrick Co., St. Paul.
 Austin Mach. Corp., Muskegon, Mich.
 Brown Hstg. Machy. Co., Cleveland.
 Bucyrus Co., So. Milwaukee, Wis.
 Cleveland Trencher Co., Euclid, O.
 Economy Eng. Co., Iowa Falls, Ia.
 Ersted Machy. Mfg. Co., Portland, Ore.
 Hayward Co., N. Y.
 Marion Steam Shovel Co., Marion, O.
 Monaghan Mach. Co., Chicago.
 Osgood Co., Marion, O.
 Owensboro Ditcher & Grader Co.,
 Owensboro, Ky.
 Parsons Co., Newton, Ia.
 Thew Shovel Co., Lorain, O.
 G. T. Topping Machy. Co., Dayton, O.

EXCAVATORS, DRAG-LINE

*Bay City Dredge Wks., Bay City, Mich.
 *Evers Mach. Co., Ravenna, O.
 *Clyde Ir. Wks. Sales Co., Duluth, Minn.
 *Erie Steam Shovel Co., Erie, Pa.
 *Galion Ir. Wks. & Mfg. Co., Galion, O.
 *Harnischfeger Corp., Milwaukee, Wis.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*

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American Paving
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- 3.—The forms were shipped ready for immediate use.
- 4.—No repairs or maintenance were required.
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- 7.—The work was speeded up.
- 8.—They were very much cheaper than wood forms.
- 9.—They were easily and economically handled.

Any large or small concreting job can be placed on a basis such as this. Consult with Blaw-Knox before you start any concreting work—before you send in your bid.

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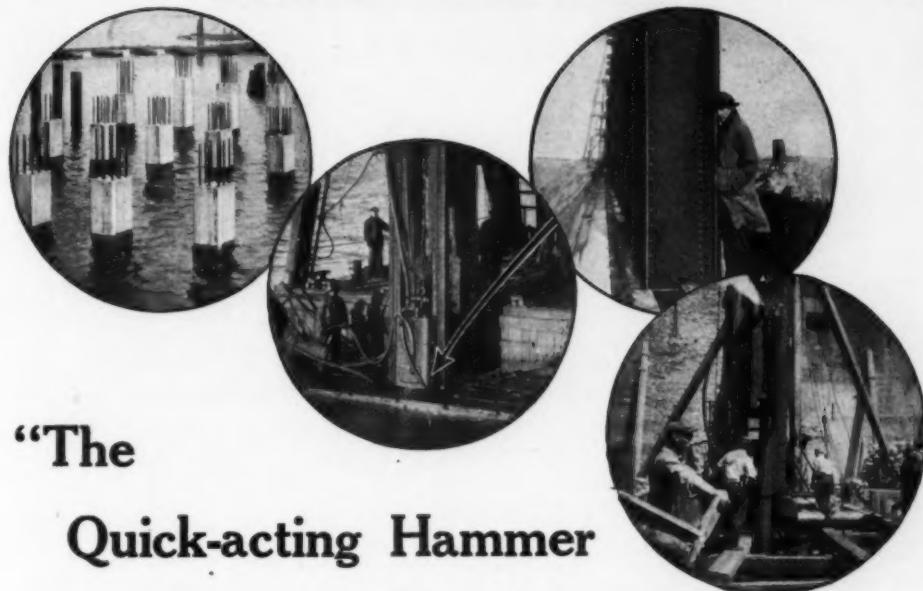
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- *Orten Crane & Shovel Co., Chicago**
 *Russell Grader Mfg. Co., Minneapolis.
 *Sauermaier Bros., Chicago.
 *T. L. Smith Co., Milwaukee, Wis.
 *Speeder Machy. Corp., Fairfield, Ia.
 *Street Bros. Mach. Co., Chattanooga, Tenn.
 Austin Machy. Corp., Muskegon, Mich.
 Brown Hstg. Machy. Co., Cleveland, O.
 Browning Crane Co., Cleveland, O.
 Bueyrus Co., So. Milwaukee, Wis.
 Economy Exc. Co., Iowa Falls, Ia.
 Eriestad Machy. Mfg. Co., Portland, Ore.
 C. L. Gade Exc. Wks., Iowa Falls, Ia.
 Hayward Co., N. Y.
 Industrial Wks., Bay City, Mich.
 Lidgewood Mfg. Co., N. Y.
 Link-Belt Co., Chicago.
 Marion Steam Shovel Co., Marion, O.
 Monighan Mach. Co., Chicago.
 Osgood Co., Marion, O.
 Schofield-Burkett Const'n Co., Macon, Ga.
 The Shovel Co., Lorain, O.
- EXPANDED METAL**
 *Truscon Steel Co., Youngstown, O.
 Berger Mfg. Co., Canton, O.
 Consolidated Exp. Metal Co., Braddock, Pa.
 Kalman Steel Co., Chicago.
 Northwestern Exp. Metal Co., Chicago.
 Youngstown Pressed St. Co., Warren, O.
- EXPANSION JOINT MATERIAL**
 Barber Asphalt Co., Philadelphia.
 *Barrett Co., N. Y.
 *Philip Carey Co., Cincinnati, O.
 W. E. Meadows, Inc., Elgin, Ill.
 *Texas Co., N. Y.
 *Truscon Steel Co., Youngstown, O.
 Hoosier Asph. Co., Alexandria, Ind.
 Pioneer Asph. Co., Lawrenceville, Ill.
 Servicized Products Corp., Chicago
 Waring-Underwood Co., Philadelphia.
- EXPLOSIVES**
 *Hercules Powder Co., Wilmington, Del.
 Atlas Powder Co., Wilmington, Del.
 E. I. Du Pont de Nemours & Co.,
 Wilmington, Del.
 Giant Powder Co., S. Francisco, Cal.
 Grasselli Powder Co., Cleveland, O.
- FENCING**
 *Stewart Ir. Wks. Co., Cincinnati, O.
 Adrian Wire Fence Co., Adrian, Mich.
 Amer. Fence & Const. Co., New York
 American Steel & Wire Co., Chicago.
 Anchor Post Iron Works, N. Y.
 Cyclone Fence Co., Waukegan, Ill.
 Dwiggin's Wire Fence Co., Anderson, Ind.
 Frost-Superior Fence Co., Warren, O.
 Ind. Steel & Wire Co., Muncie, Ind.
 Interlocking Fence Co., Morton, Ill.
 Keystone Stl. & Wire Co., Peoria, Ill.
 Kokomo Stl. & Wire Co., Kokomo, Ind.
 Nitzsman Bros., Muncie, Ind.
 Mich. Wire Fence Co., Adrian, Mich.
 Page Stl. & Wire Prod. Corp., Bridgeport, Conn.
 Pittsburgh Steel Co., Pittsburgh, Pa.
 Tex. Cyclone Fence Co., Ft. Worth, Tex.
 Wickwire-Spencer Steel Co., N. Y.
 Youngstown Sheet & Tube Co., Youngstown, O.
- FILING EQUIPMENT STEEL**
 Art Metal Constr. Co., Jamestown, N. Y.
 Berger Mfg. Co., Canton, O.
 Gen. Fireproofing Co., Youngstown, O.
 Van Dorn Iron Wks., Cleveland, O.
- FILTERS, OIL**
 S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
 Wayne Tank & Pump Co., Ft. Wayne, Ind.
- FILTERS, WATER**
 Amer. Water Softener Co., Phila., Pa.
 Graver Corporation, E. Chicago, Ind.
 International Filter Co., Chicago.
 Norwood Eng. Co., Florence, Mass.
 Roberts Filter Co., Darby, Pa.
 W. B. Scaife & Sons, Pittsburgh, Pa.
- FINISHING MACHINES, CONCRETE ROAD** (See Concrete Road Finishers)
- FIRE ALARM SYSTEMS**
 Gamewell Co., Newton Upper Falls, Mass.
- FIRE ALARM SIRENS**
 *Union Water Meter Co., Worcester, Mass.
 Erick Elec. Siren Co., St. Paul, Minn.
 Federal Signal System, Chicago.
 Hendrie & Bolthoff Mfg. & Sup. Co.,
 Denver, Colo.
 Sterling Siren Fire Alarm Co., Rochester, N. Y.
- FIRE APPARATUS, MOTOR**
 *Mack Trucks, Inc., N. Y.
 Ahrens-Fox Fire Eng. Co., Cincinnati, O.
 American-La France Fire Eng. Co., Elmsira, N. Y.
 Boyer Fire App. Co., Logansport, Ind.
 Brockway Motor Fire App. Co., Cortland, N. Y.
 Feamite-Childs Corp., Utica, N. Y.
 Hale Fire Pump Co., Conshohocken, Pa.
 Northern Fire Apparatus Co., Minneapolis, Minn.
 Peter Pirch & Sons Co., Kenosha, Wis.
 Prospect Fire Engine Co., Prospect, O.
 Seagrave Co., Columbus, O.
 Stuts Fire Eng. Co., Indianapolis, Ind.
 Waterous Fire Eng. Wks., St. Paul, Minn.
 White Co., Cleveland
- FIRE EXTINGUISHERS, CHEMICAL**
 American-La France Fire Eng. Co., Elmsira, N. Y.
 Buffalo Fire App. Corp., Buffalo, N.Y.
 C. J. Cross Mfg. Co., Inc., N. Y.
 Foamite-Childs Co., Utica, N. Y.
 Pyrene Mfg. Co., Newark, N. J.
- PIPE HOSE (See Hose, Fire)**
- FIREPROOF BUILDING MATERIAL**
 *Truscon Steel Co., Youngstown, O.
 Berger Mfg. Co., Canton, O.
 Detroit Stl. Prod. Co., Detroit, Mich.
 Gen. Fireproofing Co., Youngstown, O.
 Kalman Steel Co., Chicago.
 Kearsley & Mattison Co., Ambler, Pa.
 Kinnear Mfg. Co., Columbus, O.
 National Fireproofing Co., Pittsburgh.
 U. S. Gypsum Co., Chicago.
 Youngstown Pressed Steel Co., Warren, O.
- FIRST AID EQUIPMENT**
 American-La France Fire Engine Co., Elmsira, N. Y.
- FITTINGS, ACID RESISTING**
 *Barber Asphalt Co., Philadelphia
- FLEXIBLE JOINTS**
 *U. S. C. I. Pipe & Fdry Co., Burlington, N. J.
 Central Foundry Co., N. Y.
 Coldwell-Wilcox Co., Newburgh, N. Y.
 Crane Co., Chicago.
 United Lead Company, N. Y.
- FLOOR PLATES**
 Amer. Pressed Steel Co., Phila.
 Central Ir. & Stl. Co., Harrisburg, Pa.
 Allan Wood, Iron & Steel Co., Phila.
- FLOORING, COMPOSITION**
 *Barber Asphalt Co., Phila., Pa.
 *Barrett Co., N. Y.
 Am. Mason Safety Tr. Co., Lowell, Mass.
 Johns-Manville, Inc., N. Y.
 Marine Decking & Sup. Co., Phila., Pa.
 Franklyn R. Muller & Co., Waukegan, Ill.
- FLOORS, WOOD BLOCK**
 *Barrett Co., N. Y.
 Carter Bloxondend Flooring Co., Kansas City, Mo.
 Jennison-Wright Co., Toledo, O.
 Midland Creos. Co., Toledo, O.
 Republic Creos. Co., Indianapolis, Ind.
 Sou. Wood Preserving Co., Atlanta, Ga.
 Wyckoff Pipe & Creos. Co., N. Y.
- FLUSH TANKS**
 *Pacific Flush Tank Co., Chicago & N.Y.
- FLUSHERS, STREET (See Street Flushers and Sprinklers)**
- FORD AND FORDSON EQUIPMENT**
- AIR COMPRESSORS FOR FORDSONS**
 *Curtis Pneum. Mach. Co., St. Louis.
 *Ingersoll-Rand Co., New York
 *Schramm, Inc., West Chester, Pa.
- AIR COMPRESSORS FOR FORD TRUCKS**
 *Buhi Co., Chicago.
 *Domestic Eng. & Pump Co., Shippensburg, Pa.
 *Ingersoll-Rand Co., New York
 *Schramm, Inc., West Chester, Pa.
- BACKFILLERS**
 Waterman Corp., Detroit
- CONCRETE MIXERS ON FORD TRUCKS**
 *Amer. Com. Mach. Co., Keokuk, Ia.
 Archer Iron Wks., Chicago
 Milwaukee Conc. Mixer Co., Milwaukee.
- DUMP BODIES FOR FORD TRUCKS**
 *Anthony Co., Streator, Ill.
 *Eagle Wagon Wks., Auburn, N. Y.
 *Eaton Car & Const'n Co., Easton, Pa.
 *Heil Co., Milwaukee, Wis.
 *Highway Trailer Co., Edgerton, Wis.
 *Marion Steel Body Co., Marion, O.
 *N. Y. Cent. Iron Wks. Co., Inc., Hagerstown, Md.
 *Stewart Iron Wks. Co., Cincinnati, O.
 *Superior Body Corp., Marion, Ind.
 *Wood Hyar. Hoist & Body Co., Detroit.
 American Prod. & Trad. Co., Chicago.
 Archer Iron Works, Chicago.
 Columbian Stl. Tank Co., K. City, Mo.
 Dittwiler Mfg. Co., Galion, O.
 Galion All Steel Body Co., Galion, O.
 Griscom-Russell, N. Y.
 Hert. Dump Body Mfg. Co., Coatesville, Pa.
 Hughes-Keanan Co., Mansfield, O.
 Jennings Auto. Dump Body Co., Roanoke, Va.
 Lee Trailer & Body Co., Chicago.
 Mandt Co., Keokuk, Ia.
 Martin-Parry Corp., York, Pa.
 Pechasein Iron Works, Keokuk, Ia.
 Thompson Mfg. Co., Williston, S. C.
 Van Dorn Iron Wks., Cleveland, O.
- FORD MOTOR PUMPER**
 *American Steam Pump Co., Battle Creek, Mich.
- FORD PLOWS**
 *Roderick Lean Mfg. Co., Mansfield, O.
- FORD REPLACEMENT UNITS (AXLES AND TRANSMISSIONS)**
 *Fuller & Sons Mfg. Co., Kalamazoo.
 *Waukegan Motor Co., Waukegan, Wis.
 *Warford Corp., N. Y.
 Hinkley Motors, Inc., Detroit
 Ruckstall Sales & Mfg. Co., N. Y.
- FORD SPECIAL BODIES**
 Standard Comm. Body Corp., B'klyn.
- FORD TRUCK EXTENSION FRAMES**
 Swedish Crucible Steel Co., Detroit.
- FORDSON DITCHING MACHINE**
 Chas. T. Topping, Dayton, O.
- FORDSON HOISTS**
 *Clyde Ir. Wks. Sales Co., Duluth, Minn.
 Eriestad Mach. Mfg. Co., Portland, Ore.
 Okla. Eng. & Fdry. Co., Muskogee, Okla.
 Otis Eng. Corp., N. Y.
 Sheffield Tool & Sup. Co., Sheffield, Pa.
 Squier-Rix Co., Milwaukee.
- FORDSON LOCOMOTIVES**
 Adamson Motor Co., Birmingham, Ala.
 Brookville Track & Tractor Co., Brookville, Pa.

If you find any errors or omissions in this Where to Purchase list, please send corrections to
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"The Quick-acting Hammer Gives Us Better Penetration"

The Chief Engineer of a large Western Railroad writes as follows:

"I am anxious to specify McKiernan-Terry 9-B-2 in driving piling ahead of track, to avoid splitting. The old-style drop hammer with pile rings will not give us sufficient penetration. It also shatters the heads of the piles badly, and in time decay occurs in the cracks where the pile has split. With the anvil block used in the McKiernan-Terry Hammer, this splitting can be largely avoided, and the quick-acting hammer gives us better penetration."

McKiernan-Terry Pile Hammers are all rapid drivers because they are all double-acting. The steam (or compressed air)

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Even more important, from the financial standpoint, is the labor saving, and the fact that rapid pile driving speeds up the job as a whole.

Our Bulletin 35 covers the whole range of pile hammer work, from the heaviest concrete monoliths to the lightest wood and steel sheeting. It contains sixty interesting job pictures. In sending for it, please state whether you wish to see our local sales representative.

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19 Park Row, New York

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DOUBLE-ACTING RAPID-DRIVING
PILE HAMMERS

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FORDSON POWER SHOVELS

- *Anthony Co., Streator, Ill.
- *Inaley Mfg. Co., Indianapolis, Ind.
- Glasgow Eng. Co., St. Louis, Mo.
- Mandt Company, Keokuk, Ia.
- Milwaukee Elec. Crane & Mfg. Co., Milwaukee.
- Squier-Rix Co., Milwaukee.

FORDSON ROAD GRADERS

- *Galion Ir. Wks. & Mfg. Co., Galion, O.
- *Good Rds. Mach. Co., Kennett Sq., Pa.
- *Hadfield-Penfield Stl. Co., Bucyrus, O.
- *Russell Grader Mfg. Co., Minneapolis J. D. Adams & Co., Indianapolis, Ind.
- C. D. Edwards Mfg. Co., Albert Lea, Minn.
- Gilbert Mfg. Co., Aberdeen, S. D.
- Shaw-Enoch Tractor Co., Minneapolis Wehr Co., Milwaukee, Wis.

FORDSON ROAD ROLLERS

- *Acme Road Mch. Co., Frankfort, N. Y.
- *Austin-Western Rd. Mach. Co., Chicago.
- *Galion Ir. Wks. & Mfg. Co., Galion, O.
- *Good Rds. Mch. Co., Kennett Sq., Pa.
- Horst & Strietzel Co., Davenport, Ia.

FORDSON SAW RIGS

- *Amer. Saw Mill Mch. Co., Hackettstown, N. J.
- *Miami Tractor-Scraper Co., Troy, O.

FORDSON SCRAPER OUTFITS

- *Miami Tractor-Scraper Co., Troy, O.
- *Gustav Schaefer Wagon Co., Cleveland, O.
- Killefer Mfg. Co., Los Angeles, Calif.
- Miskin Scraper Wks., Ucon, Idaho.

FORDSON TRACTION TREADS

- *Bell City Mfg. Co., Racine, Wis.
- *Full-Crawler Co., Milwaukee, Wis.
- *Tractor Grip Wheel Co., Toledo, O.

FORDSON TRACTOR TRUCKS

- Toppins Trac Truck Co., Appleton, Wis.

FORDSON TRAILER EQUIPMENT

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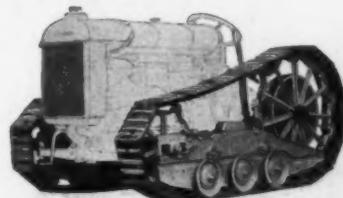
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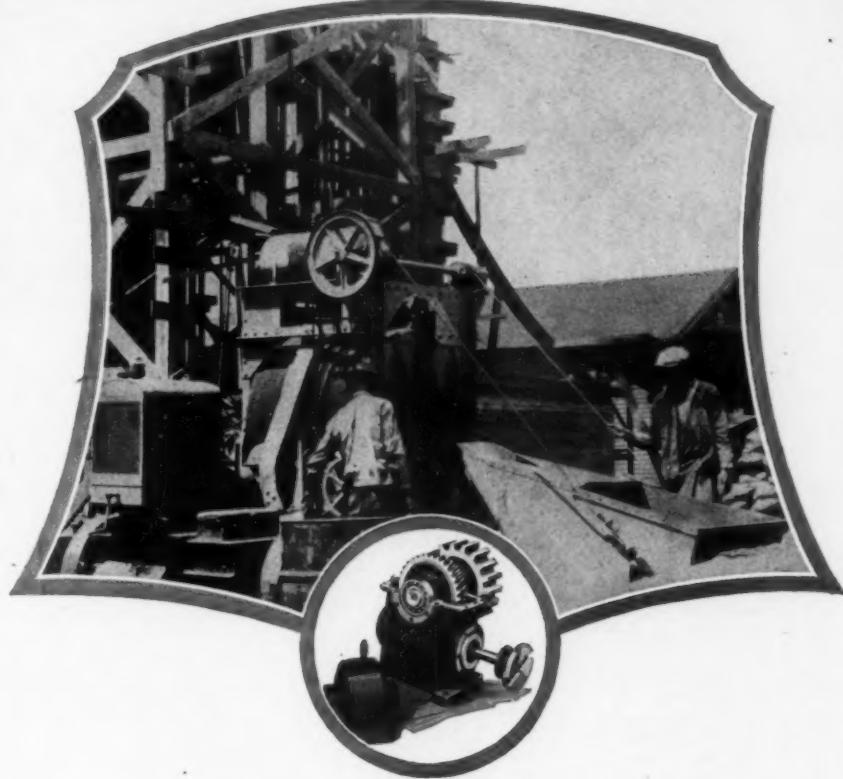
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 *Pittsburgh Meter Co., Pittsburgh, Pa.
 American Meter Co., N. Y.
 Bailey Meter Co., Cleveland, O.
 Builders Iron Fdry., Providence, R. I.
 Cleveland Gas Meter Co., Cleveland, O.
- METERS, WATER-OIL & GASOLINE**
 *Neptune Meter Co., N. Y.
 *Pittsburgh Meter Co., Pittsburgh, Pa.
 *Union Water Meter Co., Worcester, Mass.
 Badger Meter Mfg. Co., Milwaukee.
 Buffalo Meter Co., Buffalo, N. Y.
 Federal Motor Corp., E. Orange, N. J.
 Gamon Meter Co., Newark, N. J.
 Hersey Mfg. Co., Boston, Mass.
 National Meter Co., N. Y.
 Thomson Meter Co., B'klyn, N. Y.
 Worthington Pump & Mch'y. Corp., N.Y.
- METERS, WATER (VENTURI TYPE)**
 Builders Iron Fdry., Providence, R. I.
 Simplex Valve & Meter Co., Phila., Pa.
- MIXERS, CONCRETE** (See Concrete
 Mixers)
- MIXERS, GROUT**
 *Am. Gem Mch'y. Co., Inc., Keokuk, Ia.
 *Lakewood Eng. Co., Cleveland, O.
 *T. L. Smith Co., Milwaukee, Wis.
 *Union Iron Wks., Inc., Hoboken, N. J.
 Kent Mach. Co., Kent, O.
- MIXERS, HOT**
 *Barber Asphalt Co., Phila., Pa.
 *Koehring Co., Milwaukee, Wis.
- MIXERS, MORTAR**
 *Am. Gem Mch'y. Co., Inc., Keokuk, Ia.
 *Blaw-Knox Co., Pittsburgh, Pa.
 *Blystone Mfg. Co., Cambridge Spgs., Pa.
 *C. H. & E. Mfg. Co., Milwaukee, Wis.
 *Kiel Mach. Co., Kiel, Wis.
 *Lakewood Eng. Co., Cleveland, O.
 *Lakewood Eng. Co., Cleveland, O.
 *Ransome Gem Mch'y. Co., Dunellen, N.J.
 *T. L. Smith Co., Milwaukee, Wis.
 Anchor Mfg. Co., Chicago.
 Austin Mach. Corp., Muskegon, Mich.
 Construction Mach. Co., Waterloo, Ia.
 Kent Mach. Co., Kent, O.
 Knickerbocker Co., Jackson, Mich.
 Lansing Co., Lansing, Mich.
 Marab-Capron Co., Chicago.
 Talbot-Flood Mfg. Co., Kansas City, Mo.
- MIXERS, PLASTER**
 *Blystone Mfg. Co., Cambridge Spgs., Pa.
 Essick & Co., Los Angeles, Cal.
 Talbot-Flood Mfg. Co., Kansas City, Mo.
- MOTORCYCLES**
 Cleveland Motorcycle Co., Cleveland, O.
 Excelsior Motor Mfg. & Supply Co.,
 Chicago.
 Harley-Davidson Motor Co., Milwaukee.
 Indian Motorcycle Co., Springfield, Mass.
- MOTORS, ELECTRIC** (See Electric
 Generators and Motors)
- MOTORS, GASOLINE** (See Engines, Gas
 and Gasoline)
- MOTOR TRUCKS**
 *Ford Motor Co., Detroit.
 *General Motors Trk. Co., Detroit, Mich.
 *Graham Bros., Detroit
 *Mack Trucks Inc., New York
 *Buggies Motor Truck Co., Saginaw,
 Mich.
 Acme Motor Truck Co., Cadillac, Mich.
 Atterbury Motor Car Co., Buffalo, N.Y.
 Autocar Co., Ardmore, Pa.
 Bessemer Motor Truck Co., Greve City,
 Pa.
 Brockway Motor Truck Co., Cortland,
 N. Y.
 Clydesdale Motor Truck Co., Clydes, O.
 Commerco Motor Trk. Co., Ypsilanti,
 Mich.
 Diamond T. Motor Car Co., Chicago.
 Federal Motor Truck Co., Detroit.
 Four Wheel Drive Auto Co., Clinton-
 ville, Wis.
 Garford Truck Co., Lima, O.
 Gramm-Burnstein Tr. Corp., Lima, O.
 Gramm & Kincaid Motors, Inc., Lima, O.
 The Hug Co., Highland, Ill.
 Indiana Truck Corp., Marion, Ind.
 Int. Harvester Co., Chicago.
 Kelly Springfield Motor Truck Co.,
 Springfield, O.
 Larrabee-Deye Motor Tr. Co., Bing-
 hamton, N. Y.
 Pierce-Arrow Motor Car Co., Buffalo.
 Republic Truck Sales Corp., Alma, Mich.
 Service Motor Tr. Co., Wabash, Ind.
 Standard Motor Truck Co., Detroit.
 Sterling Motor Truck Co., Milwaukee.
 Stewart Motor Corp., Buffalo, N. Y.
 Traffic Motor Tr. Co., St. Louis, Mo.
 United Motor Products Co., Grand
 Rapids, Mich.
 U. S. Motor Truck Co., Cincinnati, O.
 White Co., Cleveland, O.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*



Through 19 to 24
Inches of Frost
with
The "Ditcher that
Couldn't Be Built"

Frozen ground cannot stop the "Ditcher that couldn't be built."

For instance, a public utility company, in Illinois, writes:

"—One of our machines dug continually in December and January in from 19 to 24 inches of frost. Even under this extreme condition the machine turned out from 400 to 600 feet per nine hour day."

A Montreal user tells us that the Barber-Greene crew is the last to hibernate in the face of severe Canadian winters.

Again, on a Chicago job, last February, a Barber-Greene dug 500 feet through frozen ground

during its first day on a job that the contractor had almost given up as hopeless till spring.

Only the Barber-Greene has the vertical boom that makes such phenomenal digging in frozen ground possible.

The vertical boom provides the famous "milling action" digging.

It doesn't shovel—it cuts, like a machine tool. And it digs straight through the frost in the shortest possible line.

And the patented Overload Release provides a constant safety factor which carries the Barber-Greene through frozen ground without danger of damage.

If you'd like to cut trench this winter, send for a copy of "Cutting Mains and Services." It gives details on what the Barber-Greene is doing. And if you'd like to put your prize picks and shovels—or another ditcher—up against the Barber-Greene on summer work—you'll be able to start that fight with the facts and figures in "Cutting Mains and Services."

BARBER-GREENE CO., 485 W. Park Ave., Aurora, Ill.

Representatives in 50 Cities

BARBER GREENE DITCHER

VERTICAL BOOM
Only the Barber-Greene has the vertical boom that provides the machine its "milling" action digging.

**SNOW-LOADERS
CONVEYORS**

BUCKET-LOADERS

**OVERLOAD RELEASE
SPROCKET**
Only Barber-Greene has the patented automatic release sprocket that protects both the Barber-Greene and what it encounters underground.

When writing to advertisers, please mention the Contractors' & Engineers' Monthly—Thank you.

Where to Purchase

MOULDS, CONCRETE

*Blaw Knox Co., Pittsburgh, Pa.
Kaber & Lang Mfg. Co., Kendallville, Ind.

MUCKING MACHINES

Hoar Shovel Co., Duluth, Minn.

NUMBERS HOUSE (See House Numbers)

OAKUM

Oxweld Acetylene Co., Long Island City, N. Y.

OIL BURNERS

*Aerol Burner Co., Union Hill, N. J.
*Chausse Oil Burner Co., Elkhart, Ind.
*Hauck Mfg. Co., B'klyn, N. Y.
*Alex. Milburn Co., Baltimore, Md.
Binks Spray Equip. Co., Chicago

OILS, ROAD

*Barber Asphalt Co., Phila., Pa.
*Barrett Co., N. Y.
*Standard Oil Co. (Indiana), Chicago.
*Texas Company, N. Y.
Atl. Ref. & Asp. Corp., Phila., Pa.
Headley Good Roads Co., Phila., Pa.
Pioneer Asp. Co., Lawrenceville, Ill.
Standard Oil Co. (Ia.), N. Orleans, La.
Standard Oil Co. (N. J.), Newark, N. J.
Standard Oil Co. (N. Y.), N. Y.

OXY-ACETYLENE APPARATUS

*Alex. Milburn Co., Baltimore, Md.
Oxweld Acetylene Co., Long Island City, N. Y.

PACKING, WATER PIPE

*Union Water Meter Co., Worcester, Mass.
The Leadite Co., Phila., Pa.
United Lead Company, N. Y.

PAINT GUNS

*Alex. Milburn Co., Baltimore, Md.
Binks Spray Eq. Co., Chicago
Chicago Pneum. Tool Co., New York
De Vibius Mfg. Co., Toledo, O.
Eclipse Air Brush Co., Newark, N. J.
W. N. Matthews Corp., St. Louis
Faasche Air Brush Co., Chicago
Simons Paint Spray Brush Co., Dayton, O.
Spraco Painting Equip. Co., Boston

PAINTS, METAL PROTECTION

*Barber Asphalt Co., Phila., Pa.
*Barrett Co., N. Y.
*Philip Carey Co., Cincinnati, O.
*Jos. Dixon Crucible Co., J. City, N. J.
*Solvay Process Co., N. Y.
Acme White Ld. & Col. Wks., Detroit
Berry Bros., Detroit.
Cook Paint & Varnish Co., K. City, Mo.
Detroit Graphite Co., Detroit.
Detroit White Lead Wks., Detroit.
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.

Minwax Co., N. Y.

Protexol Corp., N. Y.

Ruberoid Co., N. Y.

Servicised Products Corp'n, Chicago
Sherwin-Williams Co., Cleveland, O.
L. Sonnenborn Sons, Inc., N. Y.
Toch Bros., N. Y.

Tropical Paint & Oil Co., Cleveland, O.

Truscon Laboratories, Detroit.

PAPERS, BLUE PRINT

Ind'p'lis Blue Print & Supply Co., Ind'p'lis, Ind.

PAPER, BUILDING, ROOFING, ETC.

*Barber Asphalt Co., Phila., Pa.
*Philip Carey Co., Cincinnati, O.
*Barrett Co., N. Y.
Bird & Sons, Inc., E. Walpole, Mass.
Brown Co., Portland, Me.
Hydrox Asph. Prod. Corp., N. Y.
Johns-Manville, Inc., N. Y.
Nat. Roofing Co., Tonawanda, N. Y.
Ruberoid Co., N. Y.

PARK BENCHES

*Stewart Iron Wks. Co., Cincinnati, O.

Bausman Mfg. Co., Millersville, Pa.
Logan Co., Louisville, Ky.
Fred J. Meyers Mfg. Co., Hamilton, O.

PAVEMENT BREAKERS (See Breakers)

PAVING AND ROAD ROLLERS (See Road and Paving Rollers)

PAVING BLOCKS, CREOSOTED WOOD (See "Creosoted Blocks")

PAVING BRICK

Alton Brick Co., Alton, Ill.
Binghamton Br. Co., Binghamton, N. Y.
Buckingham Shale Brick Co., Cleveland, O.
Buffalo Brick Co., Buffalo, N. Y.
Con. Clay Prod. Co., Wilkes-Barre, Pa.
Cleveland Brick & Clay Co., Cleveland, O.
Clydeadele Brick & Stone Co., Pittsburgh, Pa.
Collinwood Shale Brick Co., Cleveland, O.
Corry Brick & Tile Corp., Corry, Pa.
Georgia Vit. Brick Co., Augusta, Ga.
Globe Brick Co., Liverpool, O.
Hammond Fire Brick Co., Fairmount, W. Va.
Hiscock Coal Co., Columbus, O.
Hocking Val. Brick Co., Columbus, O.
Layton Fire Clay Co., McKeesport, Pa.
McAvoy Vit. Brick Co., Phila., Pa.
O. P. Mayer Brick Co., Bridgeville, Pa.
Metropolis Pav. Br. Co., Pittsburg, Kan.
Metropolitan Pav. Br. Co., Canton, O.
Mineral Wells Pav. Br. Co., Mineral Wells, Tex.
Moberly Pav. Br. Co., Moberly, Mo.
Murphyboro Pav. Br. Co., Murphyboro, Ill.
Nelsonville Brick Co., Nelsonville, O.
Patton Clay Mfg. Co., Patton, Pa.
Paxton Brick Co., Watsonville, Pa.
Poebles Pav. Br. Co., Portsmouth, O.
Peoria Brick & Tile Co., Peoria, Ill.
Purington Pav. Br. Co., Galesburg, Ill.
Russell Clay Mfg. Co., Alton, Ill.
So. Clay Mfg., Chattanooga, Tenn.
Spifid Pav. Br. Co., Springfield, Ill.
Sterling Brick Co., Olean, N. Y.
Streater Clay Mfg. Co., Streator, Ill.
Terre Haute Vit. Brick Co., Terre Haute, Ind.
Thornton Fire Brick Co., Clarksburg, W. Va.
Thurber Brick Co., Thurber, Tex.
Toronto Fire Clay Co., Toronto, O.
Trinidad Br. & Tile Co., Trinidad, O.
United Clay Prod. Corp., Kansas City
Veedersburg Paver Co., Veedersburg, Ind.
West'n Shale Prod. Co., Ft. Scott, Kan.
Westport Pav. Br. Co., Westport, Md.

PAVING MACHINERY (See Road and Paving Machinery)

PAVING GUARDS, STEEL

*W. S. Godwin Co., Baltimore, Md.

PAVING MATERIALS (See "Asphalt," "Paving Brick," "Granite Block," etc.)

PAVING MIXERS (See Concrete Mixers)

PAVING TOOLS

*Aerol Burner Co., Union Hill, N. J.

*Barber Asphalt Co., Phila., Pa.

*Chausse Oil Burner Co., Elkhart, Ind.

*Connery & Co., Inc., Phila., Pa.

*Littleford Bros. Co., Cincinnati, O.

*Union Iron Wks. Inc., Hoboken, N. J.

*Warren Bros. Co., Boston.

W. H. Anderson Tl. & Sup. Co., Detroit.

F. D. Cummer & Sons Co., Cleveland, O.

PERFORATED METALS

Allis-Chalmers Mfg. Co., Milwaukee.

Hendrick Mfg. Co., Carbendale, Pa.

PICKS

Beall Tool Co., E. Alton, Ill.

Hubbard Co., Pittsburgh, Pa.
Independent Pneum. Tool Co., Chicago
Iron City Tool Wks., Pittsburgh.

Klein-Logan Co., Pittsburgh.

Oliver Iron & Steel Co., Pittsburgh, Pa.

Verona Tool Wks., Verona, Pa.

Warren Tool & Forge Co., Warren, O.

Warwood Tool Co., Wheeling, W. Va.

Wyoming Shovel Wks., Wyoming, Pa.

PILE DRIVERS

*Clyde Ir. Wks. Sales Co., Duluth, Minn.

*McKernan-Terry Drill Co., N. Y.

*Mead-Morrison Mfg. Co., E. Boston.

*Union Iron Wks. Inc., Hoboken, N. J.

Browning Crane Co., Cleveland, O.

Industrial Wks., Bay City, Mich.

Lidgerwood Manufacturing Co., N. Y.

McMyleen Interstate Co., Cleveland, O.

PILE HAMMERS, STEAM

*Clyde Ir. Wks. Sales Co., Duluth, Minn.

*McKernan-Terry Drill Co., N. Y.

*Union Iron Wks. Inc., Hoboken, N. J.

Industrial Wks., Bay City, Mich.

Ntl. Hoisting Eng. Co., Harrison, N. J.

Vulcan Iron Wks., Chicago.

PILING, CONCRETE

MacArthur Cone, Pile & P'd'n Co., N. Y.

Raymond Cone, Pile Co., N. Y.

PILING, INTERLOCKING STEEL

Bethlehem Steel Co., Bethlehem, Pa.

Carnegie Steel Co., Pittsburgh, Pa.

PIPE, CAST IRON

*U. S. Cast Iron Pipe & Fdry. Co., Bur-

lington, N. J.

Am. Cast Ir. Pipe Co., Birmingham, Ala.

Central Fdry. Co., N. Y.

J. B. Clow & Sons, Chicago.

Donaldson Iron Co., Emmaus, Pa.

John Fox & Co., N. Y.

Glanorgan Pipe & Fdry. Co., Lynch-

burg, Va.

Lynchburg Fdry. Co., Lynchburg, Va.

McWane C. I. Pipe Co., Birmingham, Ala.

Nat. C. I. Pipe Co., Birmingham, Ala.

Warren Fdry. & Machine Co., N. Y.

R. D. Wood & Co., Phila., Pa.

PIPE, CULVERT (See Culverts)

PIPE, LEAD

United Lead Company, N. Y.

PIPE, REINFORCED CONCRETE

*Newark Conc. Pipe Co., Newark, N. J.

Concrete Prod. Co., Pittsburgh, Pa.

Core Joint Conc. Pipe Co., Baltimore.

Independent Conc. Pipe Co., Indian-

apolis.

Lock Joint Pipe Co., E. Orange, N. J.

Massey Conc. Prod. Corp., Chicago.

PIPE, RIVETED STEEL OR IRON

*Blaw-Knox Co., Pittsburgh, Pa.

*Connery & Co., Inc., Phila., Pa.

*Jos. Honhorst Co., Cincinnati, O.

*Littleford Bros., Cincinnati, O.

Abendroth & Root Mfg. Co., Newburg, N. Y.

American Spiral Pipe Wks., Chicago.

Canton Culvert & Sile Co., Canton, O.

Chatta. Boiler & Tk. Co., Chatta, Tenn.

Chicago Bridge & Ir. Wks., Chicago.

E. Jersey Pipe Co., N. Y.

Hammond Ir. Wks., Warren, Pa.

R. Hardesty Mfg. Co., Denver.

Lancaster Iron Wks., Lancaster, Pa.

Petroleum Ir. Wks. Co., Sharps, Pa.

Pittsburgh-Des Moines Stl. Co., Pitts-

burgh, Pa.

Tippet & Wood, Phillipsburg, N. J.

Weller Mfg. Co., Chicago.

If you find any errors or omissions in this Where to Purchase list, please send corrections to
CONTRACTORS' & ENGINEERS' MONTHLY

Where to Purchase

PIPE, SPIRAL RIVETED

Abendroth & Root Mfg. Co., Newburg, N. Y.
American Spiral Pipe Wks., Chicago

PIPE, STEEL

Central Tube Co., Pittsburgh, Pa.
E. Jersey Pipe Co., N. Y.
Jones & Laughlin Stl. Co., Pittsburgh.
National Tube Co., Pittsburgh.
Republic Ir. & Stl. Co., Youngstown, O.
South Chester Tube Co., Chester, Pa.
Spang-Chalfont & Co., Pittsburgh, Pa.
Wheeling Stl. Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE, WOOD

Amer. Wood Pipe Co., Tacoma, Wash.
Cascade Pipe & Flume Co., Seattle, Wash.
Wash. Tank & Pipe Co., Seattle, Wash.
Mich. Pipe Co., Bay City, Mich.
Pacific Tank & Pipe Co., S. Francisco.
Redwood Mfrs. Co., S. Francisco.
Standard Wd. Pipe Co., Williamsport, Pa.
A. Wyckoff & Sons Co., Elmira, N. Y.

PIPE, WROUGHT IRON

A. M. Byers Co., Pittsburgh, Pa.
Reading Iron Co., Reading, Pa.

PIPE BENDING MACHINES

Am. Pipe Bending Mach. Co., Boston.
Walworth Mfg. Co., Boston.

PIPE COVERING

AIRCELL

*Philip Carey Co., Cincinnati, O.
Ehret Mag. Mfg. Co., Valley Forge, Pa.
Johns-Manville, Inc., N. Y.
Kearney & Mattison Co., Ambler, Pa.
Ntl. Asbestos Co., Jersey City, N. J.
Norristown Mag. & Asb. Co., Norristown, Pa.
Salt Mountain Co., Chicago
H. F. Watson Co., Erie, Pa.

55 FEB CHNT MAGNESIA

*Philip Carey Co., Cincinnati, O.
Ehret Mag. Co., Valley Forge, Pa.
Johns-Manville, Inc., N. Y.
Kearney & Mattison Co., Ambler, Pa.

WOOD

Redwood Mfrs. Co., San Francisco.
Ric-Wil Co., Cleveland, O.
A. Wyckoff & Sons Co., Elmira, N. Y.

PIPE CUTTERS (See Cutters, Pipe, Hand)

PIPE FITTINGS

*U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J.

Amer. C. I. Pipe Co., Birmingham, Ala.
Builders Iron Fdry., Providence, R. I.
Central Fdry. Co., N. Y.

J. B. Clow & Sons, Chicago.
Crane Co., Chicago.

Donaldson Iron Co., Emmaus, Pa.
Lunkenheimer Co., Cincinnati, O.
Ntl. C. I. Pipe Co., Birmingham, Ala.
Reading Stl. Casting Co., Inc., Bridgeport, Conn.

Warren Fdry. & Mach. Co., N. Y.
R. D. Wood & Co., Phila., Pa.

PIPE HANDLING MACHINERY

Mueller Company, Decatur, Ill.
Squier-Rix Co., Milwaukee.
Taylor Port. Stl. Derrick Co., Chicago.

PIPE JOINT COMPOUND (Sewer)

*Philip Carey Co., Cincinnati, O.
*Pacific Flush Tank Co., Chi. and N. Y.
G. K. Sales Co., Macungie, Pa.
Leadite Company, Inc., Phila., Pa.
Ruberoid Co., N. Y.

Waring-Underwood Co., Phila., Pa.

PIPE JOINT MATERIAL (Cast Iron)

Hydraulic Development Co., Boston.
The Leadite Co., Phila., Pa.
United Lead Co., N. Y.

PLAYGROUND APPARATUS

American Playground Device Co., Anderson, Ind.
Chicago Gym. Equip. Co., Chicago.
Everwear Mfg. Co., Springfield, O.
Giant Mfg. Co., Council Bluffs, Ia.
Hill-Standard Co., Anderson, Ind.
Fred. Medart Mfg. Co., St. Louis, Mo.
Mitchell Mfg. Co., Milwaukee.
Patterson-Williams Co., San Jose, Cal.
Playground Equipment Co., N. Y.
G. B. Spalding & Bros., Chicopee, Mass.
F. B. Zieg Mfg. Co., Fredericktown, O.

PLOWS, CONTRACTORS'

*Austin-West's Ed. Mach. Co., Chicago.
*Burch Plow Wks. Co., Crestline, O.
*Caterpillar Trac. Co., San Leandro, Cal.
*Galion Ir. Wks. & Mfg. Co., Galion, O.
*Ederick Lean Mfg. Co., Mansfield, O.
*Russell Grader Mfg. Co., Minneapolis.
*Ward Plow Co., Batavia, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, O.
Deere & Co., Moline, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
International Harvester Co., Chicago.
Moline Plow Co., Rock Island, Ill.
Oliver Chilled Plow Wks. Co., S. Bend, Ind.
Sidney Steel Scraper Co., Sidney, O.
Slusser-McLean Scraper Co., Sidney, O.
Western Wheeled Scraper Co., Aurora, Ill.

PLUMBING SUPPLIES

J. B. Clow & Sons, Chicago.
Crane Co., Chicago.
Glauber Brass Mfg. Co., Cleveland, O.
J. L. Mott Iron Wks., N. Y.
Mueller Company, Decatur, Ill.
Rundle-Spence Mfg. Co., Milwaukee.
Walworth Mfg. Co., Boston.

POLES, STEEL STRUCTURAL

*Blaw-Knox Co., Pittsburgh, Pa.
Elec. Ry. Equip. Co., Cincinnati, O.
Pitts'b'-Des Moines Stl. Co., Pittsb'h.

PORTABLE BUILDINGS

*Blaw-Knox Co., Pittsburgh, Pa.
*Littleford Bros., Cincinnati, O.

PORTABLE STEEL DERRICKS (See Derricks, Steel Portable)

PORTABLE WOOD WORKERS

Jaeger Portable Power Corp., Detroit

PORTLAND CEMENT (See Cement)

POWDER (See Explosives)

POWER PLANTS, INDUSTRIAL

*Alamo Engine Co., Hillsdale, Mich.

CLIMAX ENG. CO., Clinton, Ia.

*Continental Motors Corp., Detroit, Mich.

HERCULES CORP., Evansville, Ind.

*Hercules Motors Corp., Canton, O.

WAUKESHA MOTOR CO., Waukesha, Wis.

Buda Co., Harvey, Ill.

HINKLEY MOTORS, INC., Detroit

Sanderson-Cyclone Drill Co., Orrville, O.

WISCONSIN MOTOR CO., Milwaukee

PULLING MACHINES

John Waldron Corp., New Brunswick, N. J.

PUMPS, AIR LIIFT

*American Steam Pump Co., Battle Creek, Mich.

INGERSOLL-RAND CO., N. Y.

*Ingersoll-Rand Co., N. Y.

SULLIVAN MACH. CO., Chicago.

Chicago Pneum. Tool Co., New York.
Harris Air Pump Co., Indianapolis.
Indiana Air Pump Co., Indianapolis.

PUMPS, BOILER FEED

*American Steam Pump Co., Battle Creek, Mich.

INGERSOLL-RAND CO., NEW YORK

Aurora Pump & Mfg. Co., Aurora, Ill.

BETHLEHEM STEEL CO., BETHLEHEM, PA.

Buffalo Sim. Pump Co., Buffalo, N. Y.

A. S. CAMERON SIM. PUMP WKS., N. Y.

Chicago Pump Co., Chicago.

DAYTON-DOWD CO., QUINCY, ILL.

Dean Bros. Co., Indianapolis, Ind.

DEAN HILL PUMP CO., ANDERSON, IND.

De Laval Sim. Turb. Co., Trenton, N. J.

DEMING CO., SALEM, O.

Erie Pump & Eng. Wks., Medina, N. Y.

FAIRBANKS, MORSE & CO., CHICAGO

Gardner Governor Co., Quincy, Ill.

GOLDSU PUMPS, INC., SENECA FALLS, N. Y.

Indiana Air Pump Co., Indianapolis.

LECOURTENAY CO., NEWARK, N. J.

Morris Mach. Wks., Baldwinsville, N. Y.

MURRAY IRON WKS. CO., BURLINGTON, IOWA

Northern Fire App. Co., Minneapolis.

RUMSEY PUMP CO., SENECA FALLS, N. Y.

Scranton Pump Co., Scranton, Pa.

UNION STEAM PUMP CO., BATTLE CREEK, MICH.

Vogt Bros. Mfg. Co., Louisville, Ky.

WARREN SIM. PUMP CO., WARREN, MASS.

Weinman Pump Mfg. Co., Columbus, O.

YEOMANS BROS. CO., CHICAGO.

PUMPS, CENTRIFUGAL

*American Steam Pump Co., Battle Creek, Mich.

*DOMESTIC ENG. & PUMP CO., SHIPPENSBURG, PA.

*Humphreys Mfg. Co., Mansfield, O.

INGERSOLL-RAND CO., NEW YORK

*Keystone Driller Co., Beaver Falls, Pa.

*NOVO ENG. CO., LANSING, MICH.

*Schramm, Inc., West Chester, Pa.

ALLIS-CHALMERS MFG. CO., MILWAUKEE.

Amer. Well Works, Aurora, Ill.

AURORA PUMP & MFG. CO., AURORA, ILL.

Bethlehem Steel Co., Bethlehem, Pa.

A. S. CAMERON SIM. PUMP WKS., N. Y.

Chicago Pump Co., Chicago.

DAYTON-DOWD CO., QUINCY, ILL.

De Laval Sim. Turb. Co., Trenton, N. J.

ERIE PUMP & ENG. WKS., MEDINA, N. Y.

Fairbanks, Morse & Co., Chicago.

GOLDSU PUMPS, INC., SENECA FALLS, N. Y.

Indiana Air Pump Co., Indianapolis.

LECOURTENAY CO., NEWARK, N. J.

Manistein Iron Wks., Manistein, Mich.

Morris Mach. Wks., Baldwinsville, N. Y.

Rumsey Pump Co., Seneca Falls, N. Y.

United Iron Wks., Inc., K. City, Mo.

Wheeler Condenser & Eng. Co., Carteret, N. J.

WORTHINGTON PUMP & MFG. CO., N. Y.

Yeomans Bros. Co., Chicago.

PUMPS, CONTRACTORS'

*American Steam Pump Co., Battle Creek, Mich.

C. H. & E. MFG. CO., MILWAUKEE

*Domestic Eng. & Pump Co., Shippensburg, Pa.

*HUMPHREYS MFG. CO., MANSFIELD, O.

Ingorsoll-Rand Co., New York.

*NOVO ENGINE CO., LANSING, MICH.

Schramm, Inc., West Chester, Pa.

T. L. SMITH CO., MILWAUKEE

*Standard Scale & Supply Co., Pittsburgh.

WAUKESHA MOTOR CO., WAUKESHA, WIS.

Allis-Chalmers Mfg. Co., Milwaukee.

Amer. Well Wks., Aurora, Ill.

Aurora Pump & Mfg. Co., Aurora, Ill.

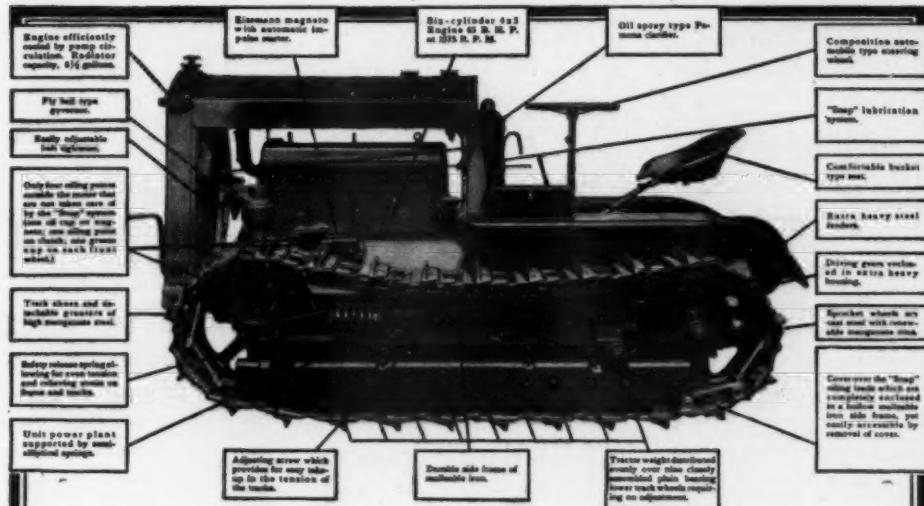
Barnes Mfg. Co., Mansfield, O.

Buda Co., Harvey, Ill.

A. S. CAMERON SIM. PUMP WKS., N. Y.

Ralph B. Carter Co., N. Y.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*



Announcing
MODEL "A," 30-45 H. P.
Cletrac

A SIX-CYLINDER tractor—of advanced design and highest quality construction. Built for heavy duty service. Designed primarily for road work. Establishes a new standard of efficiency in the high percentage of pounds pull delivered at drawbar! Handles full loads on turns as efficiently as on straight-away going! Easy to handle. Easy to steer. Easy to service. All plain bearing lower track wheels perfectly lubricated at the push of a plunger—while tractor is in motion.

Like Model "K" Cletrac, Model "A" is a tractor stripped for action. Handles the heavier power jobs with speed and certainty—and at low operation cost. A year-round tractor. 1600 square inches of tractive surface means no slippage over any footing! Six-cylinder motor insures greater economy—less vibration—smoother operation—faster acceleration.

Road Contractors, Highway Departments and Municipalities have been eagerly awaiting this year-round tractor of advanced design. Sales prove it! Here is strength, endurance, and power efficiency never before attained in tractors of similar rating. Write or mail coupon for full details.

The Cleveland Tractor Co., Cleveland, Ohio

Cletrac Crawler Tractors are unequalled for snow removal. Write for list of cities using Clettracs for this important work.

THE CLEVELAND TRACTOR CO., Cleveland, Ohio.

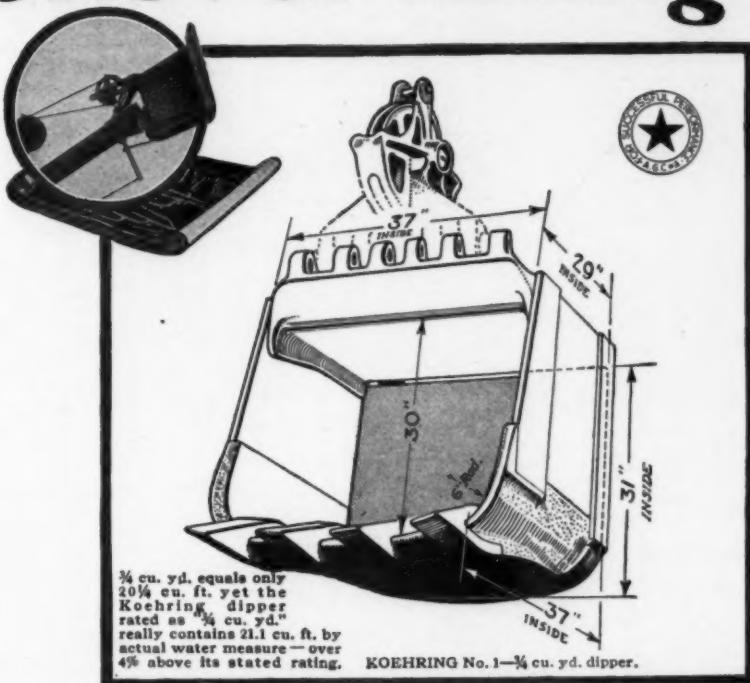
■ Please send me details of the
 Cletrac "A" 30-45 h.p. Cletrac "K" 15-25 h.p.
 Name
 Address

Where to Purchase

- Construction Mch. Co., Waterloo, Ia.
 Dayton-Dowd Co., Quincy, Ill.
 Deming Co., Salem, O.
 Emerson Pump & Valve Co., Alexandria, Va.
 Erie Pump & Eng. Wks., Medina, N.Y.
 Fairbanks, Morse & Co., Chicago.
 Goulds Pumps, Inc., Seneca Falls, N.Y.
 Kinney Mfg. Co., Boston
 LeCourtney Co., Newark, N.J.
 Morris Mach. Wks., Baldwinsville, N.Y.
 F. E. Myers & Bro. Co., Ashland, O.
 Pulsometer Steam Pump Co., N.Y.
 Rumsey Pump Co., Seneca Falls, N.Y.
 Van Nouhuys Mach. Wks., Albany, N.Y.
 Waldo Bros. & Bond Co., Boston, Mass.
- PUMPS, DEEP WELL**
 *Aldrich Pump Co., Allentown, Pa.
 *American Steam Pump Co., Battle Creek, Mich.
 *Domestic Eng. & Pump Co., Shippensburg, Pa.
 *Humphreys Mfg. Co., Mansfield, O.
 *Ingersoll-Rand Co., New York
 *Keystone Driller Co., Beaver Falls, Pa.
 Amer. Well Wks., Aurora, Ill.
 A. S. Cameron Stm. Pump Wks., N.Y.
 H. W. Clark Co., Mattoon, Ill.
 A. D. Cook, Inc., Lawrenceburg, Ind.
 Deming Co., Salem, O.
 Fairbanks, Morse & Co., Chicago.
 Goulds Pumps, Inc., Seneca Falls, N.Y.
 Harris Air Pump Co., Indianapolis.
 Indiana Air Pump Co., Indianapolis.
 Layne & Bowler Co., Memphis, Tenn.
 A. Y. McDonald Mfg. Co., Dubuque, Ia.
 Midwest Eng. Co., Indianapolis, Ind.
 F. E. Myers & Bro. Co., Ashland, O.
 Rumsey Pump Co., Seneca Falls, N.Y.
 United Iron Wks., Inc., K. City, Mo.
 Weber Subterranean Pump Co., N.Y.
- PUMPS, DREDGING**
 *Ingersoll-Rand Co., New York
 Am. Manganese Stl. Co., Chicago
 Elliott Mach. Corp., Baltimore, Md.
 Erie Pump & Eng. Co., Medina, N.Y.
 Morris Mach. Wks., Baldwinsville, N.Y.
- PUMPS, GASOLINE AND OIL**
 *Ingersoll-Rand Co., New York
 F. S. Bower & Co., Inc., Ft. Wayne, Ind.
 Gilbert & Barker Mfg. Co., Springfield, Mass.
 Kinney Mfg. Co., Boston
 Wayne Tank & Pump Co., Ft. Wayne, Ind.
- PUMPS, PORTABLE**
 *American Steam Pump Co., Battle Creek, Mich.
 *Humphreys Mfg. Co., Mansfield, O.
 Jaeger Portable Power Corp., Detroit
- PUMPS, POWER**
 *American Steam Pump Co., Battle Creek, Mich.
 *Domestic Eng. & Pump Co., Shippensburg, Pa.
 *Humphreys Mfg. Co., Mansfield, O.
 *Ingersoll-Rand Co., New York
 *Koehring Co., Milwaukee, Wis.
 *Nove Eng. Co., Lansing, Mich.
 *Waukeisha Motor Co., Waukeisha, Wis.
 Alamo Iron Wks., San Antonio, Tex.
 Allis-Chalmers Mfg. Co., Milwaukee.
 Amer. Well Wks., Aurora, Ill.
 Aurora Pump & Mfg. Co., Aurora, Ill.
 Barnes Mfg. Co., Mansfield, O.
 Chicago Pump Co., Chicago
 Dayton-Dowd Co., Quincy, Ill.
 De Laval Stm. Turb. Co., Trenton, N.J.
 Deming Co., Salem, O.
 Evinrude Motor Co., Milwaukee.
 Fairbanks, Morse & Co., Chicago.
 Gardner Governor Co., Quincy, Ill.
 Goulds Pumps, Inc., Seneca Falls, N.Y.
 Indiana Air Pump Co., Indianapolis.
 Kinney Mfg. Co., Boston
 Lawrence Mach. Co., Lawrence, Mass.
- LeCourtney Co., Newark, N.J.
 F. E. Myers & Bro. Co., Ashland, O.
 Nordberg Mfg. Co., Milwaukee.
 Northern Fire App. Co., Minneapolis.
 Rumsey Pump Co., Seneca Falls, N.Y.
 Weinman Pump Mfg. Co., Columbus, O.
 Worthington Pump & Mch. Corp., N.Y.
 Yeomans Bros. Co., Chicago
- PUMPS, SEWAGE**
 *American Steam Pump Co., Battle Creek, Mich.
 *Humphreys Mfg. Co., Mansfield, O.
 *Ingersoll-Rand Co., New York
 *Pacific Flush Tank Co., Chi. and N.Y.
 Chicago Pump Co., Chicago
 Sanitation Corp., N.Y.
 Yeomans Bros. Co., Chicago.
- PUMPS, TAR AND ASPHALT**
 Kinney Mfg. Co., Boston
- RADIATORS FOR GASOLINE ENGINES**
 Fedders Mfg. Co., Buffalo, N.Y.
 G. & O. Mfg. Co., New Haven, Conn.
 Harrison Rad. Wks., Lockport, N.Y.
 McCord Radiator Mfg. Co., Detroit
 Modine Mfg. Co., Racine, Wis.
 Racine Radiator Co., Racine, Wis.
- RAILS AND HAIL JOINTS**
 *Easton Car & Const. Co., Easton, Pa.
 *Koppel Ind. Car & Equip. Co., Koppel Pa.
 Bethlehem Steel Co., Bethlehem, Pa.
 Carnegie Steel Co., Pittsburgh, Pa.
 Sweet's Steel Co., Williamsport, Pa.
- RAILROAD DITCHERS (See Excavators, Ditch and Trench)**
- RECORDERS, WATER STAGE**
 Builders Iron Fdry., Providence, R.I.
 W. & L. E. Gurley, Troy, N.Y.
- REFRIGERATING MACHINERY (See Ice Making Machinery)**
- REINFORCING, CONCRETE (See Concrete Reinforcement)**
- RIVETERS, PNEUMATIC**
 *Ingersoll-Rand Co., N.Y.
 Alliance Machine Co., Alliance, O.
 Chicago Pneum. Tool Co., New York
 Cleveland Pneum. Tool Co., Cleveland, O.
 Hanna Eng. Works, Chicago.
 Holwig Mfg. Co., St. Paul, Minn.
 Independent Pneum. Tool Co., Chicago.
 Wm. H. Keller, Inc., Grand Haven, Mich.
 Shephard Electric Crane & Hoist Co., Montour Falls, N.Y.
 Southwark Fdry. & Mach. Co., Phila.
 Watson-Stillman Co., N.Y.
- RIVET SETS**
 *Ingersoll-Rand Co., N.Y.
 Chicago Pneum. Tool Co., New York
 Cleveland Pneum. Tool Co., Cleveland, O.
 Dunbar Drop Forge Co., Chicago.
 Independent Pneum. Tool Co., Chicago.
- ROAD GRADERS**
 *Austin-West'n Rd. Mch. Co., Chicago.
 *Baker Mfg. Co., Springfield, Ill.
 *Galion Ir. Wks. & Mfg. Co., Galion, O.
 *Good Rds. Mch. Co., Kennett Sq., Pa.
 *Hadfield-Penfeld Stl. Co., Bucyrus, O.
 *Ingersoll-Rand Co., New York
 *Russell Grader Mfg. Co., Minneapolis.
 *Spears-Wells Mch. Co., Oakland, Calif.
 J. D. Adams & Co., Indianapolis, Ind.
 J. I. Case Threshing Mach. Co., Racine, Wis.
 O.D. Edwards Mfg. Co., Albert Lea, Minn.
 Gilbert Mfg. Co., Aberdeen, S.D.
 Killefer Mfg. Co., Los Angeles
 Lyle Culv. & Rd. Equip. Co., Minneapolis
 N. S. Monroe & Sons, Arthur, Ill.
 Owensboro Ditcher & Grader Co., Owensboro, Ky.
 Shaw-Enochs Tractor Co., Minneapolis
 Stockland Rd. Mach. Co., Minneapolis.
 Western Wheeled Scraper Co., Aurora, Ill.
- ROAD OILS (See Oils, Road)**
- ROAD GRILLES**
 *Austin-West'n Rd. Mch. Co., Chicago.
 *Connery & Co., Phila., Pa.
 *Good Rds. Mch. Co., Kennett Sq., Pa.
 *Mack Trucks, Inc., N.Y.
 *Spears-Wells Mch. Co., Oakland, Calif.
 F. D. Etnyre & Co., Oregon, Ill.
 Kinney Mfg. Co., Boston
 White Co., Cleveland, O.
- ROAD SCRAPERS**
 *Acme Rd. Mach. Co., Frankfort, N.Y.
 *Austin-West'n Rd. Mch. Co., Chicago.
 *Baker Mfg. Co., Springfield, Ill.
 *Euclid Cr. & Hst. Co., Euclid Village, O.
 *Galion Ir. Wks. & Mfg. Co., Galion, O.
 *Good Rds. Mch. Co., Kennett Sq., Pa.
 *Miami Tractor-Scraper Co., Troy, O.
 *Perry Co., Sidney, Ohio.
 *Russell Grader Mfg. Co., Minneapolis.
 *Gustav Schaefer Wagon Co., Cleveland, O.
 J. D. Adams & Co., Indianapolis, Ind.
 J. I. Case Threshing Mach. Co., Racine, Wis.
 Gilbert Mfg. Co., Aberdeen, S.D.
 Killefer Mfg. Co., Los Angeles
 Lyle Culv. & Rd. Equip. Co., Minneapolis.
 Root Spring Scraper Co., Kalamazoo, Mich.
 Shaw-Enochs Tractor Co., Minneapolis
 Sidney Steel Scraper Co., Sidney, O.
 Stockland Rd. Mch. Co., Minneapolis.
 Western Wheeled Scraper Co., Aurora, Ill.
- ROAD AND PAVING ROLLERS**
 *Austin-West'n Rd. Mch. Co., Chicago.
 *Barber Asphalt Co., Phila., Pa.
 *Buffalo-Springfield Roller Co., Springfield, O.
 *Galion Ir. Wks. & Eng. Co., Galion, O.
 *Good Rds. Mch. Co., Marion, O.
 *Huber Mfg. Co., Marion, O.
 J. I. Case Threshing Mach. Co., Racine, Wis.
 Erie Mach. Shops, Erie, Pa.
 Horst & Strieter Co., Davenport, Ia
- ROAD AND PAVING MACHINERY**
 *Acme Rd. Mach. Co., Frankfort, N.Y.
 *Atlas Eng. Co., Milwaukee.
 *Austin-West'n Rd. Mch. Co., Chicago.
 *Baker Mfg. Co., Springfield, Ill.
 *Barber Asphalt Co., Phila., Pa.
 *Blaw-Knox Co., Pittsburgh, Pa.
 *Buffalo-Springfield Roller Co., Springfield, O.
 *Caterpillar Tractor Co., San Leandro, Calif., and Peoria, Ill.
 *Chaussee Oil Burner Co., Elkhart, Ind.
 *Connery & Co., Inc., Phila., Pa.
 *Easton Car & Const. Co., Easton, Pa.
 *Equitable Asph. Maint. Co., K. City, Mo.
 *Euclid Cr. & Hst. Co., Euclid Village, O.
 *Galion Ir. Wks. & Mfg. Co., Galion, O.
 *Good Rds. Mch. Co., Kennett Sq., Pa.
 *Geo. Haiss Mfg. Co., N.Y.
 *J. S. Honhorst Co., Cincinnati, O.
 *Koehring Co., Milwaukee.
 *Lakewood Eng. Co., Cleveland, O.
 *Littleford Bros., Cincinnati, O.
 *Mack Trucks, Inc., N.Y.
 *Russell Grader Mfg. Co., Minneapolis.
 *T. L. Smith Co., Milwaukee.
 *Spears-Wells Mch. Co., Oakland, Calif.
 *Universal Rd. Mch. Co., Kingston, N.Y.
 J. D. Adams & Co., Indianapolis, Ind.
 J. I. Case Threshing Machine Co., Racine, Wis.
 F. D. Cummer & Son Co., Cleveland, O.
 C. D. Edwards Mfg. Co., Albert Lea, Minn.
 Erie Mach. Shops, Erie, Pa.
 J. D. Farsey Co., Cleveland, O.
 Gilbert Mfg. Co., Aberdeen, S.D.
 Glde Rd. Mch. Co., Minneapolis.
 The Hug Co., Highland, Ill.
 Killefer Mfg. Co., Los Angeles

If you find any errors or omissions in this Where to Purchase list, please send corrections to
 CONTRACTORS' & ENGINEERS' MONTHLY

Does dipper capacity mean Anything to Shovel rating?



As an example of Koehring conservatism in rating capacities, compare the dimensions of the Koehring $\frac{3}{4}$ yard shovel dipper with the dipper dimensions of many shovels rated at 1 yard capacity!

Remember too that the Koehring dipper not only handles its full heaped-up load, but crowds above and beyond the end of the boom.

Because of independent cable crowd, the Koehring instantly adapts itself at the levers' command to meet every situation—long, shallow,

horizontal dipper strokes for shallow grading—deep, close-in gouges to dig out boulders, deep digging, high bank work, high or low loading, all are the same to the Koehring.

Shovel Capacities

No. 1— $\frac{3}{4}$ cu. yd. dipper, struck measure, on 19 ft. 6 in. boom, with 16 ft. dipper sticks; 4 cyl. 5 x 6 in. gasoline engine, 1100 R. P. M.

No. 2—1 $\frac{1}{4}$ cu. yd. dipper, struck measure, on 20 ft. 7 in. boom, with 16 ft. dipper sticks; 4 cyl., 6 x 7 in. gasoline engine, 925 R. P. M.

Send for Shovel Bulletin No. S-6

KOEHRING COMPANY MILWAUKEE WISCONSIN
PAVERS, MIXERS—GASOLINE SHOVELS, CRANES AND DRAGLINES
Sales Offices and Service Warehouses in all principal cities
Foreign Dept., Room 1370, 50 Church St., New York City.
Canada, Koehring Company of Canada, Limited, 103 Front St., East, Toronto, Ontario.
Mexico, F. S. Lapum, Cinco De Mayo 21, Mexico, D. F.
A3208-III



Where to Purchase

Kinney Mfg. Co., Boston
Lyle Culv. & Rd. Equip. Co., Minneapolis.

N. B. Monroe & Sons, Arthur, Ill.
Shaw-Enochs Tractor Co., Minneapolis
Stockland Rd. Mchly. Co., Minneapolis
United Iron Wks., Inc., K. City, Mo.

ROCK CRUSHERS AND PULVERIZERS (See "Crushers")

ROCK DRILLS (See Drills, Rock)

ROOFING, ASPHALT, COMPOSITION, TILE, ETC.

*Barber Asphalt Co., Phila., Pa.
*Barrett Co., N. Y.

*Philip Carey Co., Cincinnati, O.
*Standard Oil Co. (Indiana), Chicago.

*Texas Co., N. Y.
Amer. Cem. Tile Mfg. Co., Pittsburgh.

Atlantic Ref. & Asph. Corp., Phila., Pa.
Beaver Prod. Co., Inc., Buffalo, N. Y.

Bird & Son, Inc., E. Walpole, Mass.
Certain-teed Products Corp., N. Y.
Chatfield Mfg. Co., Cincinnati, O.
Edwards Mfg. Co., Cincinnati, O.

Flintkote Co., Boston.
Johns-Manville, Inc., N. Y.

Keystone Roofing Mfg. Co., York, Pa.
The Lehman Co., Chicago.

F. J. Lewis Mfg. Co., Chicago.
Nat'l Roofing Co., Tonawanda, N. Y.

Rubberoid Co., N. Y.
Sall Mountain Co., Chicago.

Sife Prod. Co., St. Paul, Minn.
L. Sonnenbom & Sons, Inc., N. Y.

Western Elaterite Roofing Co., Denver.

ROOFING, METAL

*Truscon Steel Co., Youngstown, O.
Amer. Rolling Mill Co., Middletown, O.

Amer. Sheet & Tin Plate Co., Pittsb'.
Berger Mfg. Co., Canton, O.

Edwards Mfg. Co., Cincinnati, O.
Klauber Mfg. Co., Dubuque, Ia.

Milwaukee Corr. Co., Milwaukee
Nat'l Sheet Metal Roofing Co., J. City, N. J.

United Alloys Steel Corp., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

ROOFING KETTLES (See Kettles)

ROPE, MANILA

Amer. Mfg. Co., B'klyn, N. Y.
Columbian Rope Co., Auburn, N. Y.

Cupples Cordage Co., B'klyn, N. Y.
Hooven & Allison Co., Xenia, O.

R. A. Kelly Co., Xenia, O.
N. Bedford Cordage Co., N. Bedford, Mass.

Peoria Cordage Co., Peoria, Ill.
Plymouth Cordage Co., N. Plymouth, Mass.

Portland Cordage Co., Portland, Ore.
Tubbs Cordage Co., San Francisco.

Wall Rope Wks., N. Y.
Waterbury Co., N. Y.

Whitlock Cordage Co., N. Y.

ROPE, WIRE, HOISTING, HAULAGE

*W'msport Wire Rope Co., W'msport, Pa.
Amer. Cable Co., Inc., N. Y.

Amer. Steel & Wire Co., Chicago.
Broderick & Bascom Rope Co., St. Louis, Mo.

A. Leschen & Sons Rope Co., St. Louis.
Fischer & Hayes Rope & Steel Co., Chicago.

Macwhye Co., Kenosha, Wis.
J. A. Roebling's Sons Co., Trenton, N. J.

Upson-Walton Co., Cleveland, O.
Waterbury Co., N. Y.

Wickwire Spencer Steel Co., N. Y.

RUBBER TIRES (See Tires)

RULES

*Lufkin Rule Co., Saginaw, Mich.

SALAMANDERS

*Littleford Brothers, Cincinnati, O.
SAFETY TREADS (See Treads, Safety)

SASH, ROLLER, STEEL (See Window
Frames and Sash)

SAW RIGS, PORTABLE

*Amer. Saw Mill Mach. Co., Hackett-
town, N. J.

*C. H. & E. Mfg. Co., Milwaukee
Beach Mfg. Co., Montrose, Pa.

Knickerbocker Co., Jackson, Mich.
Leach Co., Oshkosh, Wis.

Jones Superior Mach. Co., Chicago.

SAWS, HAND, ELECTRIC

*F. L. Rogers & Co., Chicago

Electro-Magnetic Tool Co., Chicago

Flexway Corp., Cincinnati, O.

Michel Elec. Hand Saw Co., Chicago

Wodack Elec. Tool Corp., Chicago

SCRABIFIERS

*Acme Ed. Mach. Co., Frankfort, N. Y.

*Austin-West. Ed. Mchly. Co., Chicago.

*Barber Asphalt Co., Phila., Pa.

*Buffalo-Springfield Boiler Co., Spring-
field, O.

*Galion Ir. Wks. & Mfg. Co., Galion, O.

*Good Eds. Mach. Co., Kennett Sq., Pa.

*Huber Mfg. Co., Marion, O.

*Russell Grader Mfg. Co., Minneapolis.

*Universal Ed. Mchly. Co., Kingston, N.Y.

*C. D. Edwards Mfg. Co., Albert Lea, Minn.

SCRABIFIERS, TEETH FOR

*Galon Ir. Wks. & Mfg. Co., Galion, O.

*Russell Grader Mfg. Co., Minneapolis.

Skunk Mfg. Co., Bucyrus, O.

SCRAPERS, DRAGLINE

*Jackson Mfg. Co., Harrisburg, Pa.

*Russell Grader Mfg. Co., Minneapolis.

*Sauermaier Bros., Chicago

Schofford-Burkett Const'n Co., Macon, Ga.

SCRAPERS, POWER DRAG

*Russell Grader Mfg. Co., Minneapolis.

*Sauermaier Bros., Chicago

Schofford-Burkett Const'n Co., Macon, Ga.

SCRAPERS, ROAD (See Road Scrapers)

SCRAPERS, SELF-LOADING

*Baker Mfg. Co., Springfield, Ill.

*Euclid Cr. & Hst. Co., Euclid Village, O.

*Miami Traller-Scrapers Co., Troy, O.

*Russell Grader Mfg. Co., Minneapolis.

Shaw-Enochs Tractor Co., Minneapolis

SCRAPERS, ROAD (See Road Scrapers)

SCRAPERS, SELF-LOADING

*Baker Mfg. Co., Springfield, Ill.

*Euclid Cr. & Hst. Co., Euclid Village, O.

*Miami Traller-Scrapers Co., Troy, O.

*Russell Grader Mfg. Co., Minneapolis.

Shaw-Enochs Tractor Co., Minneapolis

SCREENS, SAND, GRAVEL AND COAL

*Atlas Eng. Co., Milwaukee, Wis.

*Austin-West. Ed. Mchly. Co., Chicago.

*Galon Ir. Wks. & Mfg. Co., Galion, O.

*Good Roads Mchly. Co., Kennett Sq., Pa.

*Hains Mfg. Co., N. Y.

*Littleford Bros., Cincinnati, O.

*Russell Grader Mfg. Co., Minneapolis.

*Universal Ed. Mach. Co., Kingston, N.Y.

Allis-Chalmers Mfg. Co., Milwaukee

Austin Mfg. Co., Chicago

Brown Hstg. Mach. Co., Cleveland, O.

J. O. Bartlett & Snow Co., Cleveland, O.

J. I. Case Threshing Mach. Co., Racine, Wis.

Chain Belt Co., Milwaukee, Wis.

Deister Concentrator Co., Ft. Wayne, Ind.

Gifford-Wood Co., Hudson, N. Y.

Hendrick Mfg. Co., Carbondale, Pa.

Jeffrey Mfg. Co., Columbus, O.

Link-Belt Co., Chicago

Lyle Culv. & Rd. Equip. Co., Minneapo-
lis, Minn.

Morrow Mfg. Co., Wellington, O.

Newaygo Eng. Co., Newaygo, Mich.

New Jersey Wire Cloth Co., Trenton, N. J.

Robins Conv. Belt Co., N. Y.

H. B. Sackett Screen & Chute Co., Chicago

Webster Mfg. Co., Chicago

Weller Mfg. Co., Chicago

Wickwire Spencer Steel Co., N. Y.

SCREENS, SEWAGE

Dorr Co., New York
Green Bay Fdry. & Mach. Wks., Green
Bay, Wis.

Link-Belt Co., Philadelphia
Sanitation Corp'n., N. Y.
Simplex Ejector Co., Chicago.

SEWAGE DISPOSAL APPARATUS

*Pacific Flush Tank Co., Chicago & N. Y.
Dorr Co., N. Y.

Sanitation Corp'n., N. Y.
Simplex Ejector Co., Chicago.

SEWAGE PUMPS (See Pumps)

SEWAGE EJECTORS

*Pacific Flush Tank Co., Chicago & N. Y.
Sanitation Corp'n., N. Y.

Simplex Ejector Co., Chicago.
Yeomans Bros. Co., Chicago.

SEWER BLOCKS, SEGMENT

American Vit. Products Co., Akron, O.
Cannelton Sewer Pipe Co., Cannelton,
Ind.

Denver Sewer Pipe & Clay Co., Denver,
Col.

W. S. Dickey Clay Mfg. Co., Kansas
City, Mo.

Evans & Howard Fire Brick Co., St.
Louis, Mo.

Laclede Christy Clay Prod. Co., St.
Louis, Mo.

Macomb Sewer Pipe Wks., Macomb, Ill.
Pacific Clay Prod. Co., L. Angeles, Cal.
Red Wing Sewer Pipe Co., Red Wing,
Minn.

Robinson Clay Prod. Co., Akron, O.
Standard Fire Brick & Sewer Pipe Co.,
Pueblo, Col.

SEWER CLEANING APPARATUS

F. Bissell Co., Toledo, O.
Champion Corp., Hammond, Ind.

Self Propelling Nozzle Co., N. Y.
Turbine Sewer Mach. Co., Milwaukee.

SEWER PIPE AND DRAIN TILE

American Vit. Prod. Co., Akron, O.
Blackmer & Post Pipe Co., St. Louis

Wm. E. Dee Co., Chicago

Denver Sewer Pipe & Clay Co., Denver,
Col.

W. S. Dickey Clay Mfg. Co., K. City, Mo.

Logan Clay Prod. Co., Logan, O.

Ohio Vit. Pipe Co., Uhrichsville, O.

Robinson Clay Prod. Co., Akron, O.

SEWER PIPE FORMS

*Heltzel Stl. Form & Ir. Co., Warren,
O. Quinn Wire & Iron Wks., Boone, Ia.

Raber & Lang Mfg. Co., Kendallville,
Ind.

SEWER RODS

F. Bissell Co., Toledo, O.

Champion Corp., Hammond, Ind.

J. T. Healy, Jersey City, N. J.

Lack Sewer Equip. Co., Chicago

Turbine Sewer Mach. Co., Milwaukee.

SHINGLES, METAL

Aluminum Co. of Am., Pittsburgh, Pa.

Berger Mfg. Co., Canton, O.

Canton Art Metal Co., Canton, O.

Edwards Mfg. Co., Cincinnati, O.

Klauber Mfg. Co., Dubuque, Ia.

Milwaukee Corrugating Co., Milwaukee.

Nat'l Sheet Metal Roofing Co., Jersey
City, N. J.

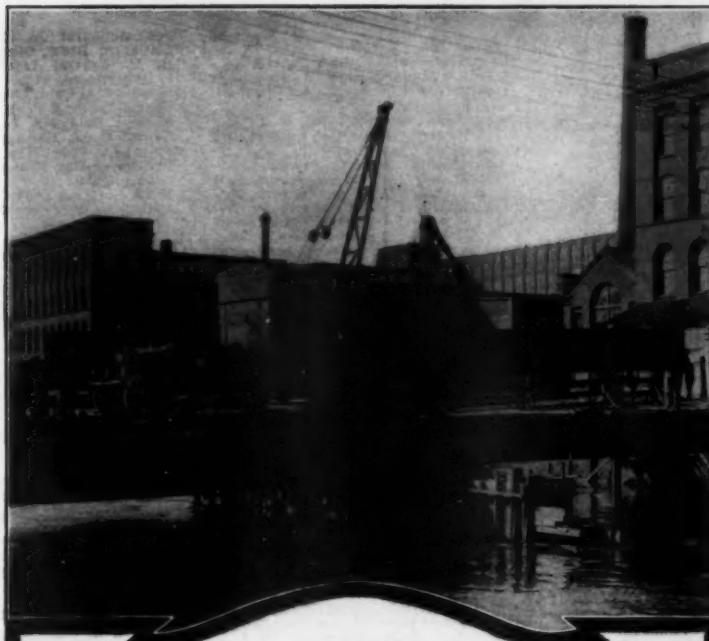
Newport Rolling Mill Co., Newport, Ky.

Penn Metal Co., Boston.

Tiffin Art Metal Co., Tiffin, O.

Wheeling Metal Mfg. Co., Wheeling,
W. Va.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*



Here's
a 5 Ton
UNIVERSAL CRANE
equipped with
WILLIAMSPORT
Telfax Tape marked—Factory certified
WIRE ROPE

handling a 7-ton girder, 52 ft. long, 48 in. deep, as easy as a man picking up a piece of firewood.

The significant thing about this is the power of the crane and ease in handling—but if the manufacturer used cheap rope of uncertain tensile strength on the job, the whole apparatus might as well be cheap.

Manufacturers of good, reliable machinery are fast getting away from considering ropes of uncertain tensile strength. They are turning to "Williamsport" the only wire rope made that proves its grade by plain English evidence woven into every inch of their wire rope.

They prefer to pay a little more and be SURE; than to use unmarked ropes and GUESS on the grade. The good name of any manufacturer is not a guarantee against mistakes.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works:

Williamsport, Pa.

Gen'l Sales Offices:

Peoples Gas Bldg., Chicago, Ill.

USE MADESCO TACKLE BLOCKS—THEY STAND THE GAFF

Where to Purchase

SHOES

Dayton Sure Grip & Shoe Co., Dayton, O.
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
H. W. Ross Co., Cincinnati, O.
Ross-Meyer-Hecht Co., Cincinnati, O.
Symons Clamp & Mfg. Co., Chicago.
Universal Form Clamp Co., Chicago.

SHOVELS, ELECTRIC

*Bay City Dredge Wks., Bay City, Mich.
*Byers Mach. Co., Ravenna, O.
*Koehring Co., Milwaukee, Wis.
Bucyrus Co., So. Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Osgood Co., Marion, O.
Thew Shovel Co., Lorain, O.

SHOVELS, GASOLINE

*Bay City Dredge Wks., Bay City, Mich.
*Byers Mach. Co., Ravenna, O.
*Harnischfeger Corp., Milwaukee, Wis.
*Koehring Co., Milwaukee, Wis.
*Orton Crane & Shovel Co., Chicago
*Speeder Machy. Corp., Fairfield, Ia.
Amer. Steel Dredge Co., Ft. Wayne, Ind.
Austin Mach. Corp., Muskegon, Mich.
Brown Hatg. Machy. Co., Cleveland, O.
Buyers Co., So. Milwaukee, Wis.
Erie Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.
McMyler Interstate Co., Cleveland, O.
Osgood Co., Marion, O.
Thew Shovel Co., Lorain, O.

SHOVELS, HAND

American Mfg. Co., Chattanooga, Tenn.
Ames Shovel & Tool Co., Boston.
Beall Bros. Co., Alton, Ill.
Conneaut Shovel Co., Conneaut, O.
Hubbard & Co., Pittsburgh, Pa.
Indiana Shovel Co., New Castle, Ind.
Jackson Shovel Co., Montpelier, Ind.
Pittsburgh Shovel Co., Pittsburgh, Pa.
Russell Shovel Co., Alquippa, Pa.
Stevens-Webb Co., Inc., Altoona, Pa.
Union Furnace Mfg. Co., Altoona, Pa.
Wood Shovel & Tool Co., Piqua, O.
Wyoming Shovel Wks., Wyoming, Pa.

SHOVELS, STEAM

*Byers Mach. Co., Ravenna, O.
*Eric Steam Shovel Co., Erie, Pa.
*Keystone Driller Co., Beaver Falls, Pa.
*Orton Crane & Shovel Co., Chicago
Austin Mach. Corp., Muskegon, Mich.
Bucyrus Stm. Shovel Co., Bellwood, Pa.
Bucyrus Co., So. Milwaukee, Wis.
Industrial Wks., Bay City, Mich.
Marion Steam Shovel Co., Marion, O.
Osgood Co., Marion, O.
Russell & Co., Massillon, O.
Thew Shovel Co., Lorain, O.

SIDEWALK AND ROAD FORMS (See "Forms, Concrete")

SIGNS, STREET AND ROAD

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Automatic Enam. & Nov. Co., Baltimore.
Elkhart Fdry. & Mach. Co., Elkhart, Ind.
Everbright Sign Co., Boston.
Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
Lyle-Signs, Minneapolis, Minn.
Municipal Street Sign Co., N. Y.
Rochester St. Sign Co., Rochester, N.Y.
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SIGNS, TRAFFIC

*Highway Trailer Co., Edgerton, Wis.
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Auto Sign Display Co. of Mo., St. Louis, Mo.

Automatic Signal & Sign Co., Chicago.
Automatic Signal & Sign Co., Canton, O.
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Crouse-Hinds Co., Syracuse, N. Y.
Elkhart Fdry. & Mach. Co., Elkhart, Ind.
Easco Mfg. Co., Peoria, Ill.

Everbright Sign Co., Boston.

Gravely Safety Signal Co., Minneapolis.

Horni Signal Mfg. Corp., Newark, N. J.

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Union Iron Prod. Co., E. Chicago, Ind.

Universal Traffic Control Co., Oklahoma City, Okla.

SLATE, ROOFING

Stephens-Jackson Co., Pen Argyl, Pa.

SLATE, STRUCTURAL

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Pennia Struct. Slate Co., Easton, Pa.
Phoenix Slate Co., Windgap, Pa.
Stephens-Jackson Co., Pen Argyl, Pa.
Structural Slate Co., Pen Argyl, Pa.

SLEEVES, TAPPING AND VALVE

Mueller Company, Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., East Orange, N. J.

SLUICE GATES (See Gates, Sluice)

SMOKE STACKS (See Stacks, Steel)

SNOW CLEANING MACHINERY

*Austin-Western Ed. Machy. Co., Chicago.

*Baker Mfg. Co., Springfield, Ill.

*Barber-Greene Co., Aurora, Ill.

*Caterpillar Tractor Co., San Leandro, Calif. and Peoria, Ill.

*Cleveland Tractor Co., Cleveland, O.

*Galion Iron Wks. & Mfg. Co., Galion, O.

*Good Rds. Mach. Co., Kennett Sq., Pa.

*La Plant-Chote Mfg. Co., Cedar Rapids, Ia.

*Mack Trucks, Inc., N. Y.

*Mead-Morrison Mfg. Co., E. Boston.

*Russell Grader Mfg. Co., Minneapolis.

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Hiway Service Corp., Wauau, Wis.

Killefer Mfg. Co., Los Angeles, Cal.

Monarch Tractors Corp., Springfield, Ill.

Owensboro Ditcher & Grader Co.,

Owensboro, Ky.

Rotary Snow Plow Co., Minneapolis.

Shaw-Enochs Tractor Co., Minneapolis.

W. M. Toy Co., Sidney, O.

Union Iron Wks., Inc., Bangor, Me.

Walshs Holyoke St. Blr. Wks., Holyoke, Mass.

SNOW FENCING (See Fencing)

SPADES (See Shovels)

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Kinney Mfg. Co., Boston

SPRATING MACHINERY FOR TREES

Bear Spray Pump Co., Lansing, Mich.

Field Force Pump Co., Elmira, N. Y.

Fitzhenry-Guptill Co., E. Cambridge, Mass.

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STEAM TURBINES (See Turbines)

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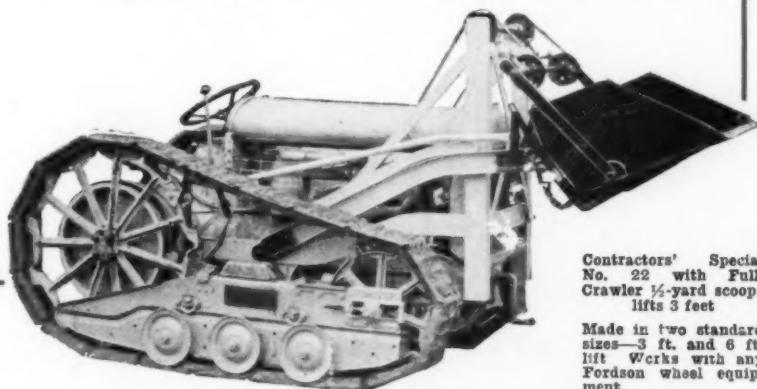
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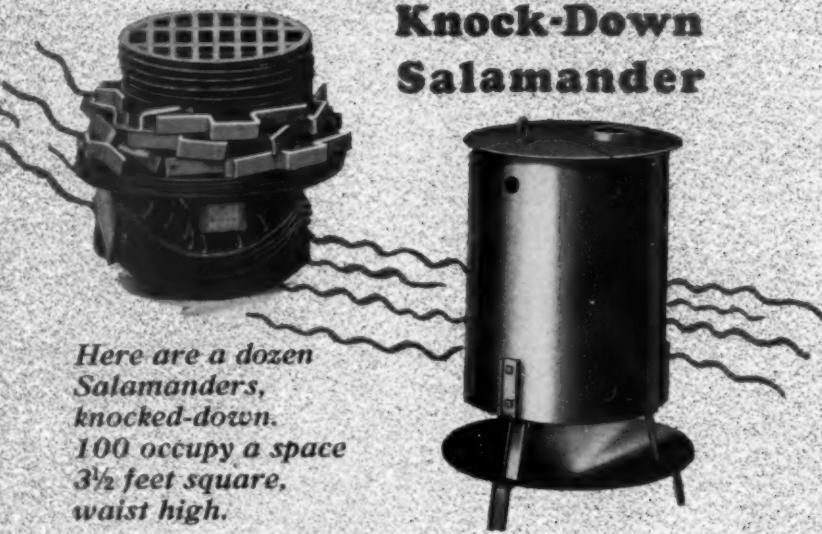


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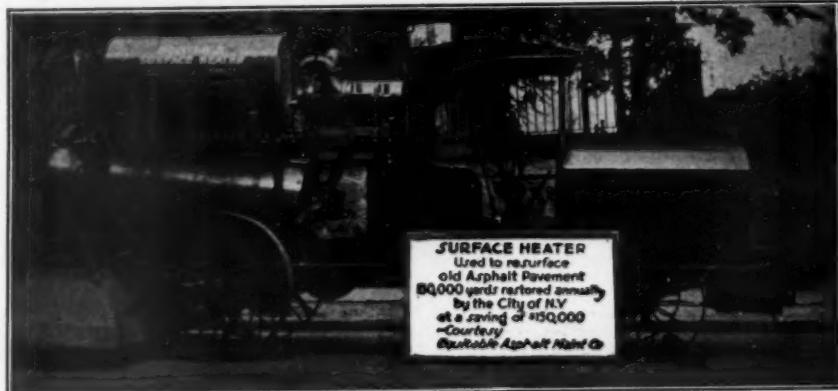
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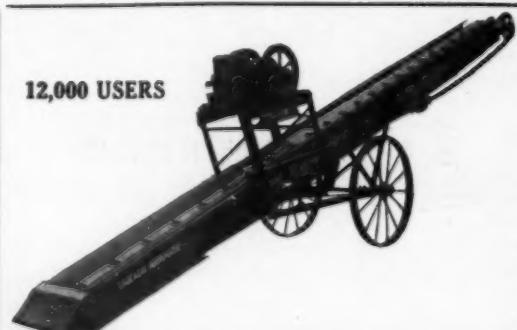
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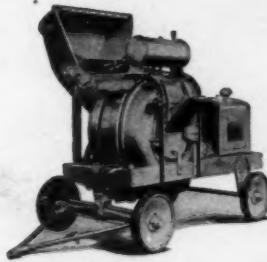
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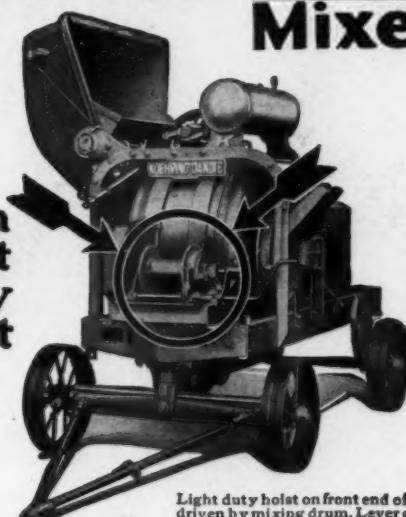


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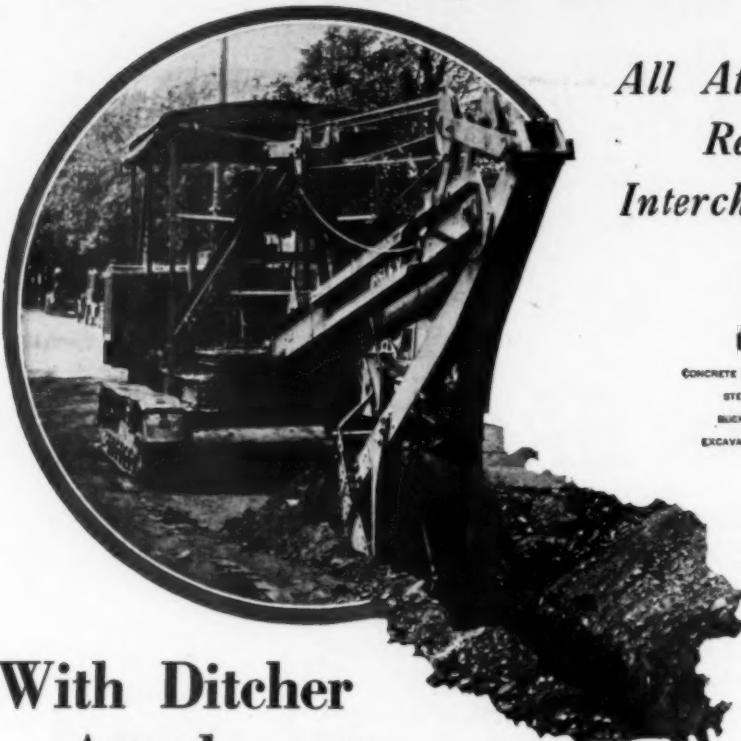
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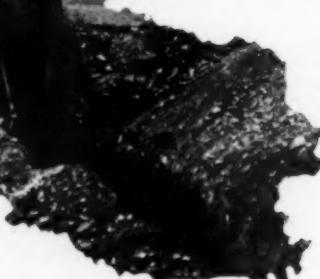
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Contractors' and Engineers' Monthly

October,

No. 4

1926

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what it really means

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Vol. XIII

No. 4

Contractors' and Engineers' Monthly

October,
1926

Building the Substructure for the Million-Dollar Pier at Miami Beach, Fla.

By JOHN McCALL

Superintendent of Construction, Frederick Snare Corporation, New York City

THE large amusement pier being built at Miami Beach, Fla., is to be 600 feet long and 50 feet wide for 440 feet outshore. From this point, the deck will be about 100 feet in width. There is nothing unusual about the structure aside from the fact that it is being built in the open sea, well within the West Indian hurricane belt. The concrete substructure was completed about July 20 and on July 26 the first of the series of West Indian hurricanes which have horrified the country took full possession of the South Florida coast. The wind at Miami Beach reached a velocity of about 60 miles per hour, piling up enormous seas. For a period of about 24 hours the pier was attacked from all sides and underneath by the heavy pressure of the water. At no time during this period was it possible to walk out on the pier, as the heavy seas were breaking completely over the deck. As soon as the storm subsided a careful examination revealed that no damage had been done. Not the slightest crack could be found in the entire structure. In several instances sections of broken-up craft and floating timbers that were lashing around among the columns underneath the pier caused a little chafing of three or four of the columns, but nothing worthy of mention. The terrible hurricane of September 18 and 19 caused no more damage than the earlier hurricane, with the exception that a large vessel was thrown against the outer end of the pier, causing some damage to eight bays of the substructure.

Substructure

The reinforced concrete substructure of the pier is of the beam and girder type designed for a live load of 125 pounds per square foot. It is supported on 159 cylindrical-shaped reinforced concrete columns 30 inches in diameter. These columns are spaced 20 feet on

centers in a longitudinal direction for a distance of 440 feet outshore and 16 feet on centers from this point to the end of the pier. The spacing of the columns in the transverse direction is practically 16 feet throughout. The average length of the supporting columns is about 20 feet over the entire area of the pier. The 30-inch shaft of these columns is seated in all cases on a spread footing 4 feet in diameter and 3 feet high, an average of 12 inches of which is imbedded in the solid coral rock of the ocean floor.

Superstructure

A modern two-deck, fireproof, steel building is being erected over the entire area of the pier. The first deck consists of 81 concessions or stores which range in size from 10 x 12½ feet to 16 x 12½ feet, about 40 per cent of the stores being equipped with plumbing facilities. In these concessions competition is reduced to a minimum, because of the fact that they were granted on a selective basis, no two stores having the same line of goods. These stores being in the center of the pier will be flanked on each side by a promenade deck which extends the full length of the pier. On the outer end of the pier this promenade broadens considerably and here fishing privileges will be sold at a minimum charge. In addition to the stores there will be a large sea-food restaurant and cabaret at the outshore end.

Second Deck

The second deck is divided into three units. The first unit, which is on the inshore end of the pier, consists of a large moving picture theater, 240 feet x 50 feet, estimated to seat 1,200 spectators. At the entrance to the theater a large handsome foyer has been designed, the ceiling of which will be 43 feet above the first deck. This theater is modern

in every respect and will compare favorably with any moving picture house in the country.

The second unit consists of a radio broadcasting station 200 x 50 feet, to be equipped with two steel masts 150 feet in height. This unit is divided into three sections, consisting of an equipment room, broadcasting room, and a large auditorium. The radio station is of the most modern design and will be one of the leading stations in the South.

The third unit, which is located on the outer shore end, comprises a ballroom with a floor area of 16,000 square feet, estimated to accommodate 1,100 couples. A feature of the ballroom will be the location of the band-stand in the center of the dance floor.

Sinking the Supporting Columns

Cribbing was erected on the shore to the desired elevation of the completed columns. On this was erected a traveler with a large derrick, three-drum Lambert hoisting engine, swinging engine, and boiler. The derrick was of the stiff-leg type and had a boom 80 feet in length with a lifting capacity of about 10 tons.

A heavy frame guide with steel rails for legs was also built. This was used to set the cylinders in their exact position. The guide was found to be very necessary on account of the heavy seas which would have washed the cylinders from their positions before they could have been driven. This equipment, with the addition of a No. 9 McKiernan-Terry steam-hammer, completed the plant necessary for the driving of the cylinders.

The first operation after placing the guide was to lower a steel cylinder made of $\frac{3}{8}$ -inch boiler plate with the customary butt straps, down inside the guide to the ocean floor. These cylinders were about 20 feet in length. After the cylinder had been plumbed and brought to exact position inside the guide by the use of adjustable timbers provided for that purpose, the steam-hammer with its grillaged driving base was placed on top of the cylinder and driving commenced. In practically all cases the cylinders were driven perfectly plumb, very little trouble being experienced by drifting or sliding of the steel shells on the bottom. The driving of the steel shells was done with great care so as to obtain a minimum penetration of at least ten inches in the coral rock of the ocean floor. After the driving of one shell had been completed the guide was lifted vertically by the derrick boom of the driven cylinder and spotted in the correct position for the next cylinder, this operation being repeated until the four-cylinder bent was completed.

The next operation was the cleaning out of the steel shells preparatory to placing the concrete. Before cleaning was begun eight $1\frac{1}{4}$ x 6-foot steel dowels were driven around the circumference of the cylinder. The dowels were properly located as follows: First, a template was placed on top of the steel cylinder with the necessary holes for spacing the dowels in correct position. A $1\frac{1}{2}$ -inch pipe was inserted in one of the holes and plumbed by men standing on top of the template. As soon as the pipe was brought to a vertical position inside the cylinder, the steel dowel was dropped down inside the pipe and a special steel follower inserted inside the pipe on top of the dowel.

The driving of the dowels was done by a heavy Ingersoll-Rand paving breaker striking on top of the follower. In all cases the dowels were driven to such an elevation as would permit them to project up into the spread footing about three feet. The driving of these dowels had a tendency to break up and spall off any soft rock on the surface of the ocean floor. After the dowels were all in place the cylinder was mucked out clean, all loose rock and sand being removed, after which a diver was sent down to make the final inspection.

The next step was to insert the collapsible cylindrical-shaped steel forms in which the columns were poured. The steel forms were fitted at the bottom with a spread-out steel base four feet in diameter, which, when lowered down inside the steel shell, came in close contact with the wall of the shell itself. These steel forms were supported at the desired elevation on top of the steel cylinder. The elevation being such that the flared-out bottom of the steel form would be at the correct elevation to form a footing four feet in diameter and about three feet thick. After the steel form had been brought to line and grade inside the steel cylinder, the steel reinforcing rods of the columns were lowered inside the form in such a manner that the steel reinforcing would be covered with about three inches of concrete. The vertical reinforcing steel was made up of eight one-inch deformed bars accurately spaced around the circumference of the form. In addition to the vertical steel the customary one-quarter-inch hooping was used, spaced about 12 inches center to center. The vertical reinforcing was of such a length that the upper ends of the steel bars projected into the deck girders about 20 inches.

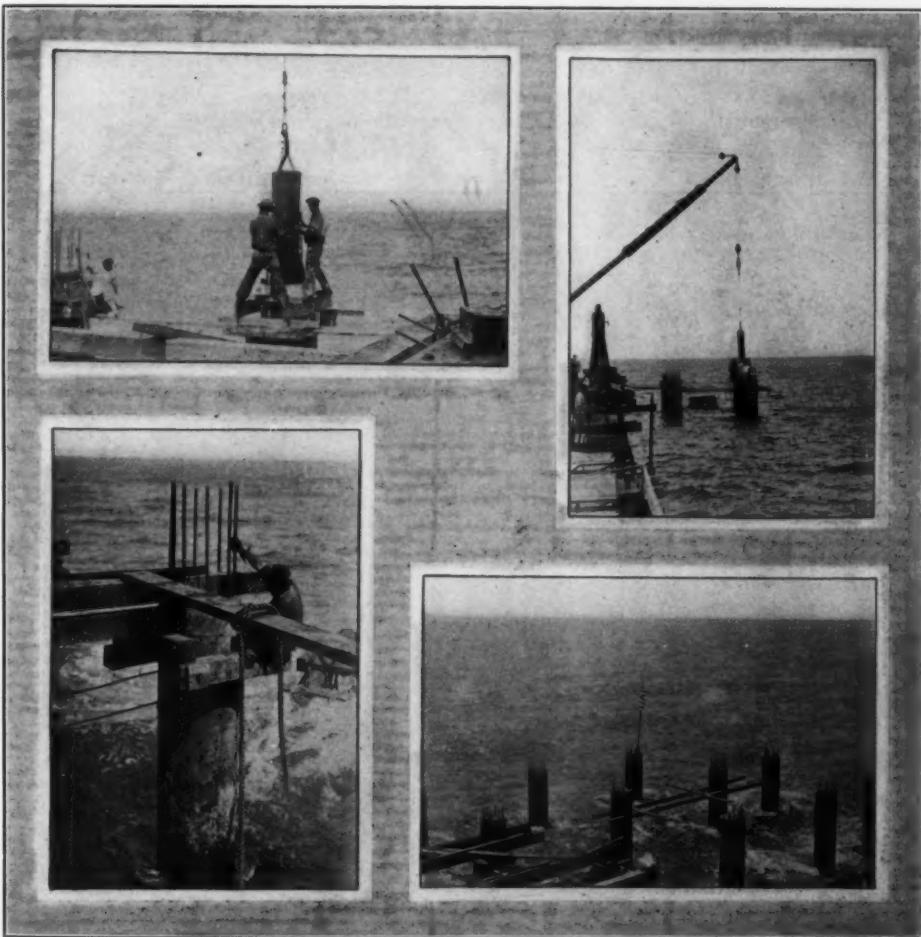
Rapid-Hardening Concrete Used

It was evident at the outset of the work that rapid-hardening concrete would have to be used. Otherwise it would have been impos-

sible for the erection traveler and equipment to proceed forward day by day on the completed columns. Several trials were made with patented hardeners to facilitate quick setting, but after experiment it was decided to use Lumnite cement, and this material was used throughout the entire job exclusive of the deck. The pouring of the concrete inside the steel forms under water and all the way up to grade was accomplished in the usual way with a bottom-dump bucket of about one-half-yard capacity. No effort was made to seal the bottoms and pump out the cylinders, as is sometimes done to pour the balance of the cylinders in the dry.

Rapid Progress of Erecting Traveler

As soon as a 4-cylinder bent had been poured and set for 24 hours, stripping was started so as to permit the erecting traveler to move forward on the completed columns for the driving of the next bent of cylinders. The stripping of the steel forms was accomplished by releasing the adjusting and holding cables which were used to secure it in position inside the cylinder. The steel cylinder itself was fitted at its lower end with a short sleeve of the same diameter as the cylinder and all that it was necessary to do to lift the steel cylinder up over the completed concrete columns was to remove the bolts that were used to fasten the sleeve



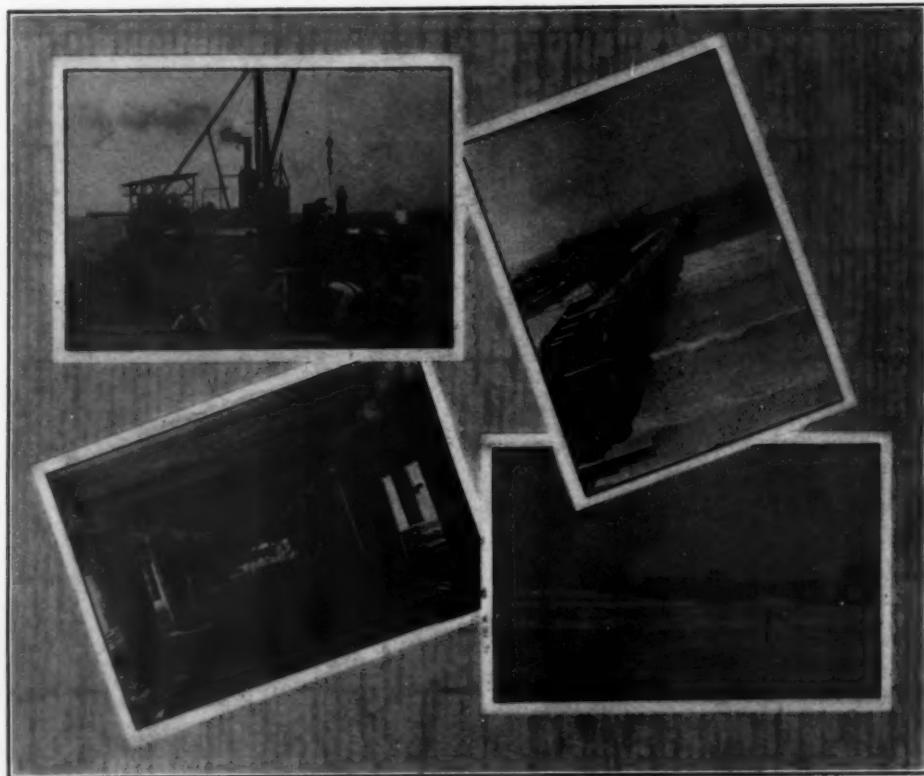
BUILDING THE MILLION-DOLLAR PIER AT MIAMI BEACH, FLA.

Upper left.—Pouring columns with bottom-dump buckets. Upper right.—Distant view, showing derrick handling bottom-dump bucket. Lower left.—A completed column showing stay-laths being placed. Lower right.—Completed columns at outshore end of pier before placing of deck

to the cylinders. These bolts were removed by divers and the steel sleeve was left in position, imbedded in the ocean bottom as extra precaution against wash or scour. After stripping, the customary running timbers were placed in position on top of the concrete columns and the traveler pulled ahead for the next bent. This operation was repeated successfully without accident of any kind over the 24-hour concrete from one end of the pier to the other. The traveling derrick with its machinery was a very heavy rig with large wheel loads. As soon as the erecting traveler had moved forward for several bents, work on the concrete deck was begun. This reinforced beam and girder type deck was poured in the usual way on forms which, of course, could not be supported from below with shoring, as is generally done.

The supporting equipment for the deck forms consisted of transverse timber stay-laths for the full width of the pier. These stay-laths were securely bolted to each concrete

column with 1-inch bolts so as to obtain as much friction as possible. In addition to the transverse stay-laths, a short 8 x 8 toggle was securely bolted to each column in a longitudinal direction directly underneath the stay-lath and in close contact with the underside of it. Of course, the friction obtained with bolted stay-lath and toggles would have supported a considerable load, but it was thought advisable not to depend on friction alone to take all of the thrust, and in order to be on the safe side a 1-inch U-bolt was used over the top of the column. This hairpin U-bolt was of proper size to slip down over the top of the columns in a transverse direction and its threaded lower ends were inserted in holes that had previously been bored in the toggles. This U-bolt was pulled up tight with long-handled wrenches and no slipping occurred in spite of the fact that the dead loads on the 20-foot panels were very great. After the forms and stay-lath had been removed, the U-bolt was cut off right up under the soffit of the beam



A SERIES OF CONSTRUCTION PHOTOGRAPHS OF THE MIAMI BEACH PIER

Upper left.—The traveler at work. Upper right.—The top of the finished deck. Lower left.—Underpart of the deck after completion. Lower right.—Typical heavy seas which occurred throughout the construction period

and the only metal wasted was the short horizontal part that rested on top of the cylinder. The cut off U-bolts were rewelded by the blacksmith on the job and were used over and over again.

Central Mixing Plant

Concrete for the entire structure was mixed in a central mixing plant located inshore and the concrete was transported outshore over the completed work for both columns and deck slab in a specially constructed car designed for the purpose. No trouble was experienced with the quick-setting alumina cement and first-class concrete was obtained.

The aggregate consisted of a clean silicious sand obtained at Bartow, Fla., about 200 miles from the work and the stone used was the hard coral rock which is used all over southern Florida for all classes of concrete work.

Steel Superstructure

The steel superstructure which is being erected on the pier is of the usual type of balloon framing. This steel is being erected by the general contractors with a specially designed A-frame traveling derrick equipped with a 75-foot boom. This derrick started operations at the inshore and is backing outshore as the steel erection progresses. At the proper time a few slight changes will be made in the rig and the operation will be reversed, starting the erection outshore and backing inshore until the building is completed. The erecting derrick was designed as a double-ended rig

with this idea in view. At the inshore end of the pier a stiff-leg derrick was erected for the purpose of handling and sorting the steel in the storage yards. It was necessary to build a wall of tongue-and-groove Wakefield sheeting along the sea side of the derrick to protect it from the seas which kept breaking in most of the time. The ground conditions and the site were such that it was impractical to set the derricks farther inshore where they would have been safe from the ravages of the sea. These derricks, together with the customary air drilling and riveting equipment, make up the steel erection plant.

The writer has had considerable experience on water-front work in different parts of the country, always in protected harbors and rivers, and can vouch for the difficulty and extra cost of building a structure of this nature in the open sea.

The pier is being built by the Miami Pier Corporation, of which G. R. K. Carter is President. The structure was designed by R. A. Preas of Miami and he is represented on the job by Frank Godwin as Engineer. The substructure was built and the steel superstructure is being erected by the Frederick Snare Corporation, with the writer as Superintendent, Frank Dickson as Office Manager, and Charles Kline, Engineer. The structural steel is being furnished by the Ingalls Iron Works, Birmingham, Ala., and all patented joints are being furnished by the Massillon Bar Joist Company, of Canton, Ohio.

A Portable Central Mixing Plant

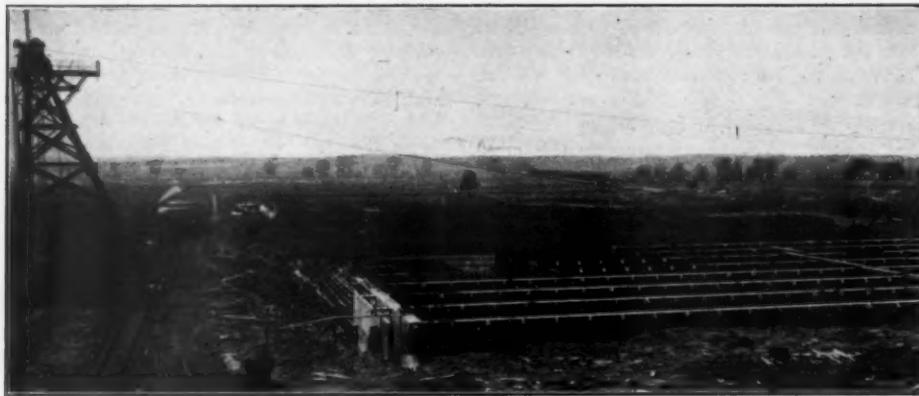
Well-Devised Unit Used on Galveston, Texas, Sea Wall

J. W. ZEMPTER & COMPANY, contractors, Galveston, Texas, recently purchased a Smith 27-E paver equipped with a special tower, elevating bucket and hopper for chuting concrete from different locations from the Alamo Steel and Supply Company, Houston, Texas, local distributors for the T. L. Smith Company. This equipment is here shown pouring the new Galveston sea wall. It combines in one movable machine a complete central mixing plant. The extreme length of the causeway job makes this portability desirable, since the whole outfit can be moved on the paver traction. Excessive haulage of mixed concrete is thus avoided. The paver is a standard Smith 27-E and the boom and

bucket which have been removed can be replaced for road paving work when desired.



SMITH MIXER POURING GALVESTON SEA WALL



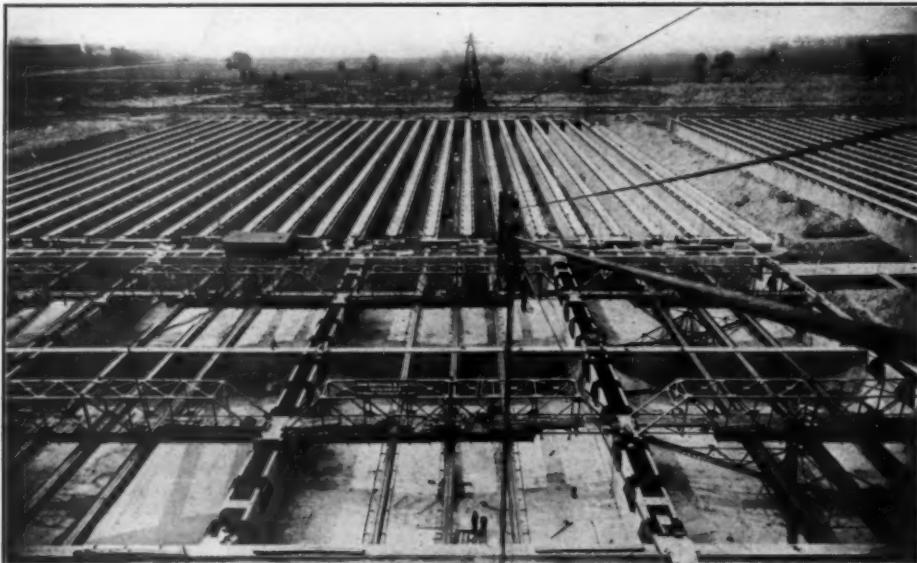
CABLEWAY LAYOUT ON ORIGINAL CONTRACT FOR CONSTRUCTION OF AERATION

Construction Plant Features of the North Side Sewage Treatment Works, Chicago, Ill.

By LAWRENCE B. BARKER
Senior Assistant Engineer, Sanitary District of Chicago

AN unusual example of the use of two widely different types of concrete-placing equipment on the same project and by the same contractor, each selected to fit the conditions on the job where it is employed, and both supplied with concrete from the same

central mixing plant, is afforded on the construction of the new North Side Sewage Treatment Works of the Sanitary District of Chicago. Here, a contractor's plant, originally planned for the first section of this huge project, has been adapted for use on three other



BATTERY C OF AERATION AND SETTLING TANKS SEEN FROM THE NORTH TOWER ON THE CABLEWAY



SETTLING TANKS, NORTH SIDE SEWAGE TREATMENT WORKS, CHICAGO

sections as contracts for these were obtained.

This treatment plant, the largest activated sludge installation in the world, is being built by the Sanitary District of Chicago to serve practically all the north side of Chicago and the suburban towns of Niles Center, Evanston, Wilmette, Winnetka, and Glencoe, a total tributary population of 800,000 people. The site of the work is a tract of approximately 100 acres, on the west side of the North Shore Channel, lying just outside the northern city limits of Chicago and within the limits of the village of Niles Center.

The construction of the entire treatment works is divided into eight construction contracts besides numerous contracts for equipment. Of the six construction contracts so far

awarded, the John Griffiths and Son Company have been the successful bidders on four. The first of these, awarded in August, 1923, was for the construction of the treatment plant proper, consisting of 36 aeration tanks, each 34 feet 9 inches by 420 feet, 30 settling tanks, each 77 feet square, operating galleries, and adjacent sewage and sludge conduits. It was for this contract that the original construction plant layout was designed.

Material Handling for Aeration and Settling Tanks

In selecting the type of construction plant and its arrangement, the controlling features were: the layout of the various units of the



CENTRAL CONCRETE MIXING PLANT AT THE NORTH SIDE SEWAGE TREATMENT WORKS, CHICAGO, ILLINOIS



SAND AND GRAVEL BINS UNDER THE TREASLE TRACK WITH BELT CONVEYORS AND BUCKET ELEVATORS TO MIXING PLANT

work to be done; the quantity of concrete and other materials to be placed; and the necessary rate at which construction must be prosecuted. The question of getting materials to the site was easily answered, as a branch line of the Chicago and Northwestern Railroad runs diagonally through the property near its east side. The three batteries of aeration and settling tanks lie in the north half of the site, parallel to its north property line, beginning about 300 feet west of the tracks, covering an area of nearly 20 acres. The major quantities to be placed were: 117,600 cubic yards of concrete; over 6,000 tons of reinforcing steel; 1,300 tons of cast iron pipe; in addition to precast concrete units and miscellaneous equipment. Three years and four months was the specified time for the completion of the contract, but as the remainder of the 1923 season had to be given up to excavation and preliminary work, and as a safe margin for completing the work indicated that the last year would be needed for setting equipment, grading the grounds, road building, and the final clean-up, a tentative program was adopted under which the bulk of the work would be completed in two seasons. This meant the placing of 400 cubic yards of concrete a day and a corresponding schedule for handling steel and cast iron pipe. The placing of this quantity of concrete, while not in itself a formidable undertaking, was complicated by the fact that the individual runs were limited

by the expansion joints, which were so located that nowhere, in footings or walls, except in the operating galleries and the floors of the settling tanks, could a continuous pour of more than 75 cubic yards be made. This meant that the plant adopted must not only be of sufficient capacity for the program outlined, but must be capable of covering the entire area of construction and of being easily and economically moved from one part of the work to another. It should also be able to handle not only concrete but any of the materials to be placed. For these reasons, the use of a central mixing plant and cableway was decided upon.

Central Mixing Plant

The central mixing plant, located on the main material switch near the railroad, consists of two electrically operated Koehring mixers, each of 1 cubic yard capacity, mounted on the first floor of a three-story timber structure, elevated to give clearance below the mixers for a 5-cubic-yard concrete bucket on a flat car. Above the mixers is the charging floor, and the third level is taken up with the sand and gravel bins. Each mixer is charged with sand and gravel from the bins above by a set of Johnson automatic hoppers. Sand and gravel are received in bottom-dump cars, unloaded through an elevated trestle track into receiving hoppers built below the track, which discharge through hand-controlled gates onto belt conveyors. These carry the aggregates to a double bucket conveyor, so arranged that either sand or gravel can be handled into any of the storage bins above the mixers. There are three of these bins—two for gravel, of 160 cubic yards each, and one for sand, of 300 cubic yards, set between the other two.

Bulk cement has been used entirely for the construction of the main work. It is received in paper-lined cars and unloaded by electrically operated plows, hand controlled, into the hopper of a bucket elevator which feeds it into a double storage bin of 3,000-barrel capacity. A screw conveyor under the bins carries the cement to a second bucket elevator, which raises it again to an auxiliary bin above the level of the charging floor. Small steel dump cars, operating on a narrow-gage loop track on the charging floor, carry the cement to the mixers. The amount for each batch is measured by weight into the car as the car passes over a set of platform scales under the discharge gate of the auxiliary cement hopper.

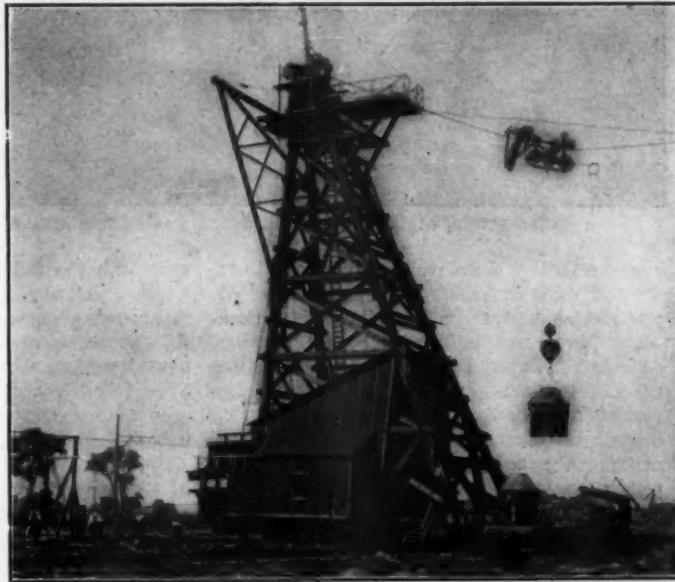
The Cableway

The 15-ton Lidgerwood cableway consists of

two 85-foot timber towers, 38 by 56 feet at the base, traveling on a 5-rail track. For the construction of the aeration and settling tanks, these tracks were laid north and south of the three batteries and parallel to them, giving a span of 805 feet and a tower travel of 1,600 feet. Motive power is furnished by two 85-h.p. electric winches, one on each tower, operating cables attached to deadmen at either end of the tower tracks. The hoisting equipment is a 300-h.p. motor, direct-connected to a double-drum hoist. The main carrying cable is $2\frac{1}{2}$ inches in diameter. All movements of the tower or bucket are controlled by an operator at the south tower, directed by a signalman

battery, the concrete schedule was maintained by keeping only two concrete buckets in service, the empty bucket being hauled to the mixers and returned, full, to the tower while the one previously brought out was being transported by the cableway to the forms, emptied, and returned ready to be set down on the flat car when the loaded one was picked up. To keep up the same production for the second and third battery, it was necessary to install a spring-switch siding along the service track and to use two trains of flat cars and dinkey locomotives, and three buckets, the empty train waiting on the siding until the loaded one had passed. When operating without interruption,

OPERATING
TOWER OF CABLE-
WAY, SHOWING
FIVE-CUBIC-YARD
BUCKET OF
CONCRETE ON WAY
TO THE FORMS



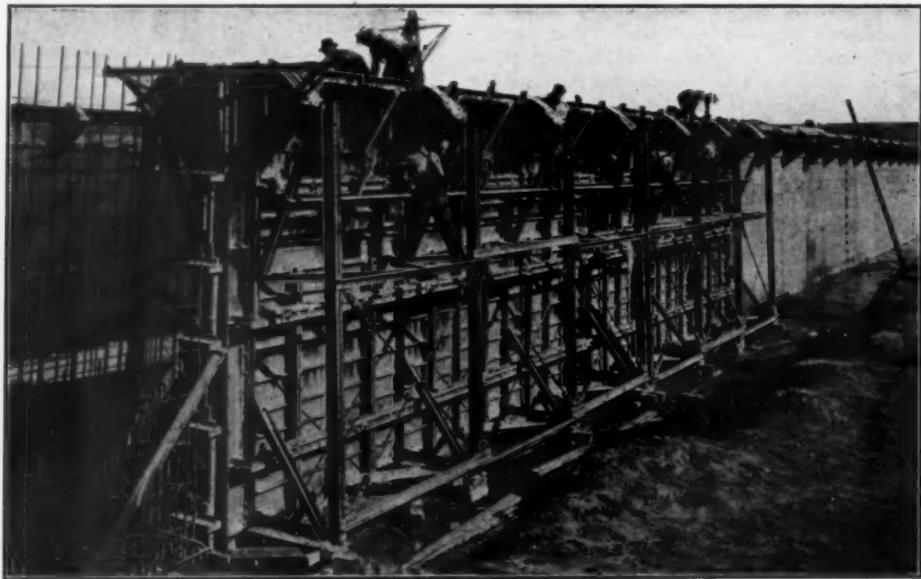
from any point of the work by means of an electric signaling system carried by a light cable between the two towers.

Each tower is served by a standard-gage track connected with the main material tracks, making it possible to receive loaded cars of material or equipment at either tower. All concrete in the case of the original contract was handled over the south service track, a lead from which runs directly under the central mixing plant. For the construction of the aeration and settling tanks, the distance from the mixing plant to the farthest position of the cableway was 1,800 feet, and from the south tower to the north wall of the settling tanks was 700 feet, making a total distance of 2,500 feet over which the concrete had to be transported. During the construction of the nearest

the average run from the mixing plant to the forms could be made in five minutes.

Concreting in the aeration and settling tanks was started June 10, 1924, and continued up to December 10. It was resumed March 25, 1925, and completed, except for finishing the surface of the settling tank floors, on August 15, 1925. During the first season, a total of 65,175 cubic yards of concrete of all classes was poured, and 45,510 cubic yards during the second season. The average daily run for the entire two seasons was 412 cubic yards, but for eight months, when work was continuous, this was raised to 500 cubic yards for eight hours.

Reinforced steel, cast iron pipe, structural steel, and equipment were also handled with this cableway. A notable instance of its use was the setting of the structural steel bridges



THE 62-FOOT, 9-INCH BLAW-KNOX STEEL FORMS FOR AERATION TANK WALLS

over the settling tanks which support the Dorr clarifying mechanisms. These bridges are of 78-foot span and weigh approximately 11 tons. They were assembled and the field riveting done in the material storage yard east of the tanks. Then, when ready to set, each bridge was lifted onto a flat car by a locomotive crane, drawn over the north service track to a point opposite the tank where it was to be set, picked up by the cableway, using a special sling, and set in place on the anchor bolts on top of the tank walls. On one occasion, eight bridges were set in this way in three hours.

Forms

In order to maintain a schedule of 400 cubic yards of concrete daily, the use of forms which could be easily and quickly moved was of vital importance. The long straight walls of the aeration tanks, divided by the expansion joints into lengths of 62 feet 9 inches, seemed particularly suited to the use of steel forms. These were designed and manufactured by the Blaw-Knox Company with the intention of using the cableway to handle them. They were built to conform to the lengths of the walls between expansion joints, two sections of forms making up the unit of 62 feet 9 inches, except the stub walls, 21 feet 9 inches long at the ends, which were poured monolithic with the walls of the influent channel and the operating gallery, and for which special short lengths were used. All

were built the full height of the wall, 17 feet 6 inches, and included forms for the walkways, and concrete supporting-brackets for the baffle slabs at the top of the wall, made up of special hinged sections which could be dropped back, away from the wall, in stripping.

In moving the steel forms with the cableway, half of a 62-foot 9-inch length was handled at a time by means of a sling or yoke consisting of a 6-inch pipe, nearly the length of the forms, stiffened by a wood filler and carrying short lengths of chain with hooks which engaged lifting lugs on the outside of the forms. After hooking onto the forms, and taking a tension on the sling, a slight movement of the cableway away from the wall was enough to loosen the form from the concrete, and it was then lifted and moved into position for the next section of wall.

Wooden forms were used for the aeration tank influent channel walls, the operating-gallery walls, beams and slabs, and the walls of the settling tanks. These were all built-up panels of $\frac{3}{4}$ -inch x 3-inch matched and dressed lumber, using 2-inch x 6-inch studs with rangers built up of two 2-inch x 6-inch stringers, between which the $\frac{3}{4}$ -inch tie bolts were passed. For the settling-tank walls of the last battery to be constructed, the wooden forms were made in panels the full 16-foot height of the wall and 26 feet long, using 6-inch x 8-inch rangers. These panels were handled by the cableway,

using the same rig as for the steel forms. They were found especially advantageous, not only for ease of moving but for greater rigidity and durability. All the wooden forms stood up well under the heavy usage to which they were subjected. The large built-up panels were used as many as eight times and were still serviceable.

In general the use of the steel forms resulted in greatly decreased labor costs as compared with that on the wooden forms. A comparison of actual figures, however, is unfair, as the wooden-form cost covers the work on complicated sections as well as on straight walls.

Material Handling on Contracts K and P

In the fall of 1925, contracts were awarded for the construction of grit chambers and preliminary settling tanks and of the sewage pumping-station and blower house, Divisions K and P, respectively, the John Griffith and Son Company being again the successful bidders. The grit chambers are a group of twelve channels, each 8 feet wide by 80 feet long, together with influent and discharge channels, all to be housed in a one-story brick building, the superstructure of which, about 150 feet square, is included in another contract. There are eight preliminary settling tanks, each 80 feet square, with the necessary influent and effluent conduits and piping. Included in the contract for the preliminary tanks are the furnishing and placing of eight Dorr clarifiers and their supporting bridges, similar to those placed under the original contract but of 3 feet longer span. These structures are located in the space south of the east half of the main batteries.

The pumping-station and blower house, located on the opposite side of the C. & N. W. tracks from the treatment plant proper, will

be housed in a rather ornamental building of brick and steel construction, 187 feet by 307 feet in plan, on a heavy concrete substructure containing the screen chamber, sewage channel and pump-pits at a depth of 45 feet below the ground surface, pump-room and discharge channels.

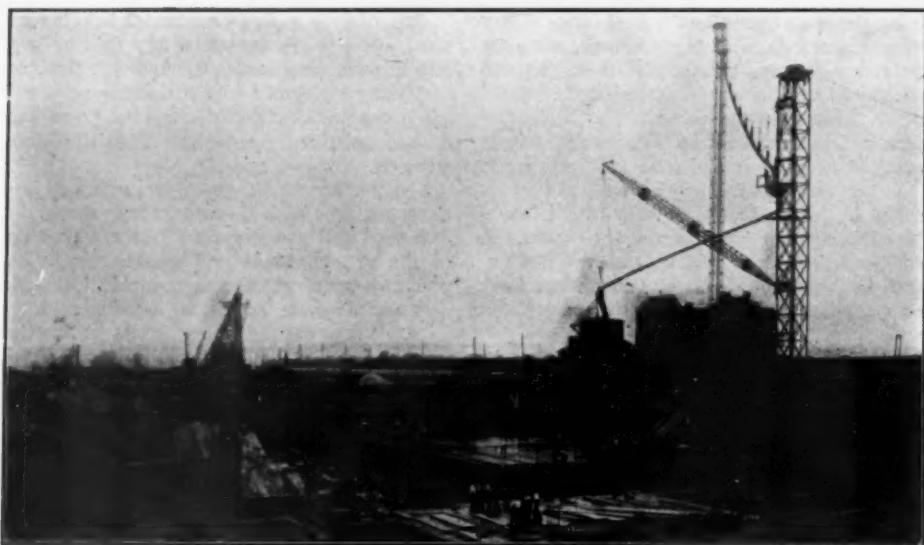
The placing of 14,000 cubic yards of concrete, together with the reinforcing steel, cast iron pipe and equipment for the construction of the grit chambers and preliminary tanks, presented practically the same problem, though on a smaller scale, as that on the original contract. It was decided, therefore, to utilize the same equipment that had been so successful there. To do this, it was necessary to turn the south tower of the original cableway layout to face in the opposite direction and to move the north tower some 1,200 feet, to beyond the south side of the new construction, and to turn it to face north. This resulted in a shortened span of approximately 450 feet. The concrete service-track was relaid to serve what is now the north tower, leading from the central concrete plant as before. As the cableway was still in service placing the backfill around the three main batteries it was not moved until early in the spring of 1926, the remainder of the 1925 season being spent in making the rough excavation for the tanks and preliminary work.

Steel Chuting Tower Used

The use of the cableway was also suggested for the construction of the substructure of the pumping-station, but as this would have necessitated a crossing over the Northwestern tracks, and as the area around the pumping-station structure was limited, the use of the cableway was practically out of the question. Then, too,



DEPOSITING CONCRETE WITH CABLEWAY AND FIVE-CUBIC-YARD BUCKET IN THE PRELIMINARY SETTLING TANKS



SEWAGE PUMPING-STATION SUBSTRUCTURE SHOWING THE LAKWOOD TOWERS AND CENTRAL CONCRETE MIXING PLANT

the concrete to be placed—19,000 cubic yards—was in relatively large quantities, in a much smaller area, and the work was more centralized. It was determined, therefore, to adopt a system of towers and chutes, taking the concrete from the central mixing plant. To do this, a 210-foot Lakewood steel tower was erected at the back of the mixing plant, chuting to a secondary tower 120 feet high, at the north side of the pumping-station, about 330 feet from the main tower. A counter-balanced chute, suspended from a derrick boom on the secondary tower, reaches any point of the substructure. A movable spout under the receiving hopper at the mixers makes it possible to feed the concrete into the one-yard bucket of the tower system or into the five-cubic-yard bucket supplying the cableway on Division K.

Wooden forms are being used on both the preliminary tanks and the pumping-station substructure. These are similar in design to those described for use on the settling-tank walls of the main battery. As far as possible, they have been made in large panels, and, with the special forms necessary, were built up in the carpenter shops during the winter. The large panel forms for the settling-tank walls are being handled by the cableway.

Because of the more intricate nature of the work on Divisions K and P, concrete progress has been much slower than on the original contract. While it was expected to alternate the concreting between the two jobs, the necessity

of giving greater attention to the work on the pumping-station, especially on the deeper sections, has tended to slow up work on the preliminary tanks. The rate of pouring with the chuting system is, at best, 45 cubic yards per hour, as against an average of 60 cubic yards per hour with the cableway. From April 16 to August 1, 11,220 cubic yards of concrete was placed in the pumping-station substructure.

Main Building Substructure

The John Griffiths and Son Company was awarded the contract for the main building, Division Q, in May, 1925. This is a brick and steel structure, approximately 55 x 300 feet in plan, housing the sludge pumps, main sewage meters, office, laboratories, store rooms, etc. Some 6,300 cubic yards of concrete will be required in the substructure, together with a quantity of reinforcing steel, cast iron pipe, structural steel, and miscellaneous castings.

This structure is to be built south of the batteries and west of the preliminary tanks and use will be made of the cableway.

The design and construction of the North Side Sewage Treatment Works has been carried out as part of the program of sewage treatment by the engineering department of the Sanitary District of Chicago, of which E. J. Kelly is Chief Engineer. The author was resident engineer in charge of construction up to June, 1926, when he was succeeded by B. J. Curtis, Assistant Engineer.

The Flatbush-Flatlands Relief Sewer in Brooklyn

By ARTHUR J. GRIFFIN and JOHN C. RIEDEL

Chief Engineer and Assistant Engineer, respectively, Bureau of Sewers, Borough of Brooklyn, N. Y.

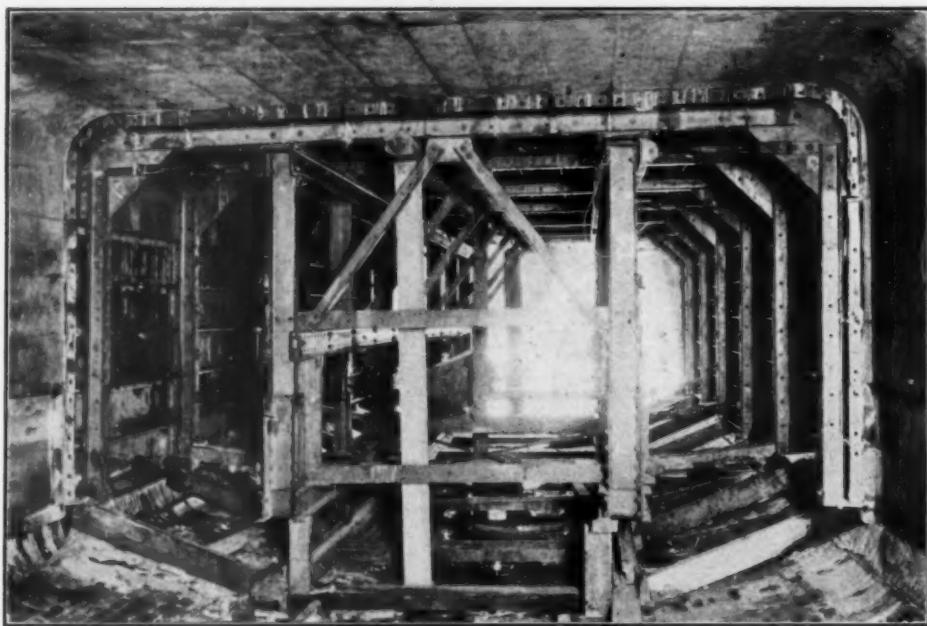
THERE has recently been completed and placed in service in the Borough of Brooklyn, City of New York, the first section of one of the largest sewer improvements undertaken by New York City. The contract price was \$3,250,134 and the successful bidder was the P. J. Carlin Contracting Company, which company, before beginning operations, assigned its contract to the Montröse Contracting Company, of which J. P. Carlin is President.

The improvement lay partly in the former town of Flatlands and partly in the former town of Flatbush and was designed to relieve from frequent flooding in times of heavy rain an area of about 1,300 acres lying in Flatbush, embracing a densely built-up area containing an important residential and business section of the borough. It will also give combined service for an additional 2,100 acres in Flatlands which is developed densely in parts, sparsely in others, and undeveloped in the remaining area. The combined sewers which have been relieved by the new construction were built twenty-five years ago, shortly after

the consolidation in 1898 of the City of Brooklyn and other municipalities with the then City of New York into what is now the Greater City of New York. At that time Flatbush was a suburban town, Flatlands a farming district with scatterings of houses, and the sewers were designed for a development to be expected with the type of transit then in existence and projected. The advent of the Brighton Beach Railroad Improvement and of the Nostrand Avenue Subway Railroad produced changes that were revolutionary in character, as suburban localities and others sparsely developed were brought within easy reach of the business centers. The suburban sections were rapidly overtaken by apartment house developments, streets were covered with impervious pavements, lawns disappeared, and the necessity for relief sewers became manifest. The new sewers have a capacity of three times those relieved and were designed by the "rational method" now in general use throughout the country. The district through which the new sewers were built is generally flat, having but little slope. The elevations of the street



THREE PARALLEL BARRELS OF RELIEF SEWER UNDER CONSTRUCTION, SHOWING INVERTS COMPLETE AND REINFORCING FOR SIDES



NORTH BARREL OF 216-INCH FLATBUSH RELIEF SEWER, SHOWING BLAW-KNOX STEEL FORMS AND METHOD OF MOVING THEM

surfaces range from about 11 feet to about 25 feet above high water. The soil encountered has a top layer of about 3 feet of loam, below which is sand of good quality and which was used in concrete for the sewer. The sewers range in size from a 3-barrel section

equivalent in capacity to 216-inch and 204-inch diameter circles, respectively, a 2-barrel section equivalent respectively to 198-inch and 180-inch diameter circles, to a single barrel of ratings equivalent to 150-inch, 138-inch, and 132-inch diameter circles.



VIEW OF COMPLETED 150-INCH RELIEF SEWER

There were short lengths of connecting sewers 66 inches, 60 inches and 48 inches in diameter. The total length of the sewers built was 15,280 linear feet.

Contract Time Better by Use of Extensive Equipment

The contract provided that work should be carried on simultaneously in five locations so that the entire contract could be completed in the contract time of four hundred working days.

The subgrade of the sewer at its outlet lay at about 10 feet below the normal water table. Water was encountered in the trenches for about 10,000 feet of the length of the work. The 180-inch, 150-inch, 138-inch, and 132-inch

As an adequate supply of labor was difficult to obtain, the use of mechanical appliances was imperative. The contractor used steam shovels, gasoline-driven crawler cranes which operated clamshell buckets and dragline buckets for excavating purposes, air hammers for driving of sheeting, crawler-mounted concrete mixers, motor trucks for transportation of material, gasoline-motor-driven pumps, and an hydraulic machine for the bending of the reinforcement bars.

Construction of Upper Section

Work was begun first in the upper section upon the 180-inch sewer. Steam shovels excavated until it became necessary to place sheeting and bracing. When this had been



METHOD OF REMOVING EXCAVATED MATERIAL FROM CUT

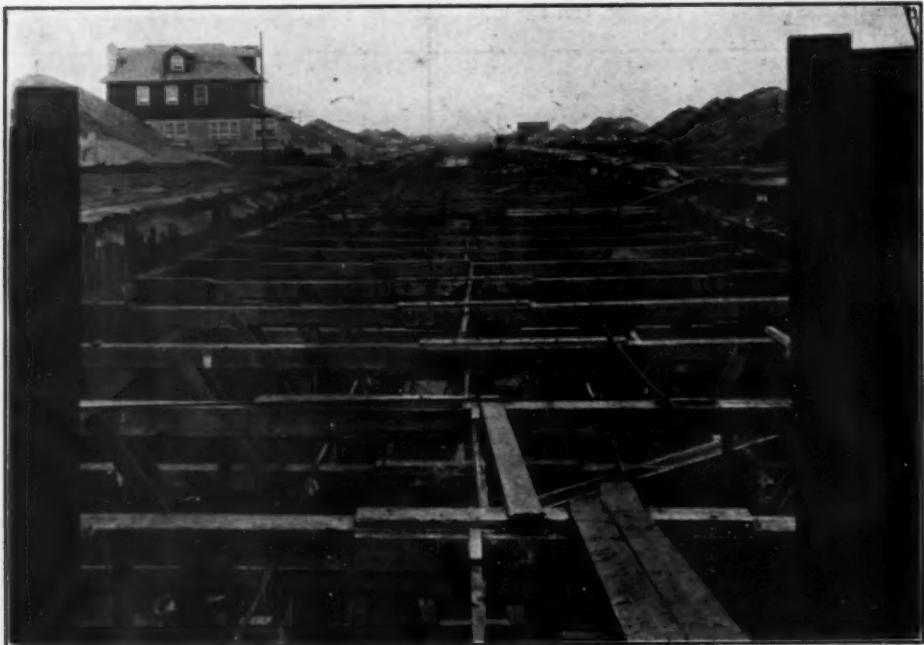
were built in dry trenches. The large volume of water removed, the size of the trenches and the sewers built therein, made the contract a noteworthy one. The contractor divided the work into two distinct operations with separate superintendence. The lower or outlet section lay generally in open country and it was here that the large volume of ground water was encountered, requiring special methods to control it. The upper section where no ground water was encountered lay in a built-up residential section where close sheeting of trenches was necessary to protect adjacent structures from damage.

The contractor performed a noteworthy achievement in completing the work several months ahead of the contract period by the use of extensive mechanical equipment.

accomplished, the crawler cranes fitted with clamshells carried the excavation down to sub-grade. The deepest cut was 29 feet and the width of this trench was 32 feet. Two tiers of sheeting were required, the lower tier being of 3-inch plank and the upper of 2-inch. The braces were 8-inch by 8-inch and 10-inch by 10-inch. The lowest brace was just above the inner-bottoms of the sewer and was removed when the invert concrete had been placed and was sufficiently set. A novelty in the form of wrought iron pipe posts under the braces was introduced. Where more than one barrel of sewer was built the posts were placed in the division walls and extended above the level of the sewer roof. When the sewer section was completed they were cut off at the roof top and grouted. The sheeting below the top of

the sewer was used as a back form for the concrete and was left in place. The upper tier of sheeting was left in place where its removal would have caused damage to adjacent pavements, curbs, and other city structures. Otherwise this sheeting was drawn as the trenches were backfilled. The concrete was mixed in crawler machines which were placed alongside the trench. Concrete as it was mixed was chuted to the designated place below. The sand and gravel were stored in nearby streets and were conveyed as needed to the mixers in small auto trucks. The concrete was placed directly on the sand foundation previously levelled off to the required

fill was placed upon the roof, but the trenches were not backfilled for several weeks thereafter. At East 27th Street and Farragut Road the twin sewer divides, one section extending westward to East 21st Street and Foster Avenue where a connection was made with the 25-year-old, 120-inch Foster Avenue sewer, thereby effecting a relief anxiously awaited by the residents whose premises had been periodically flooded for a number of years. The other section extends eastward to Rogers Avenue and Foster Avenue, where a connection was made to an old town sewer of Flatbush. Both the East 21st Street and Rogers Avenue branches will be extended to the north



TYPICAL BEACING OF SHEETING ALONG THE LINE OF THE FLATBUSH RELIEF SEWER

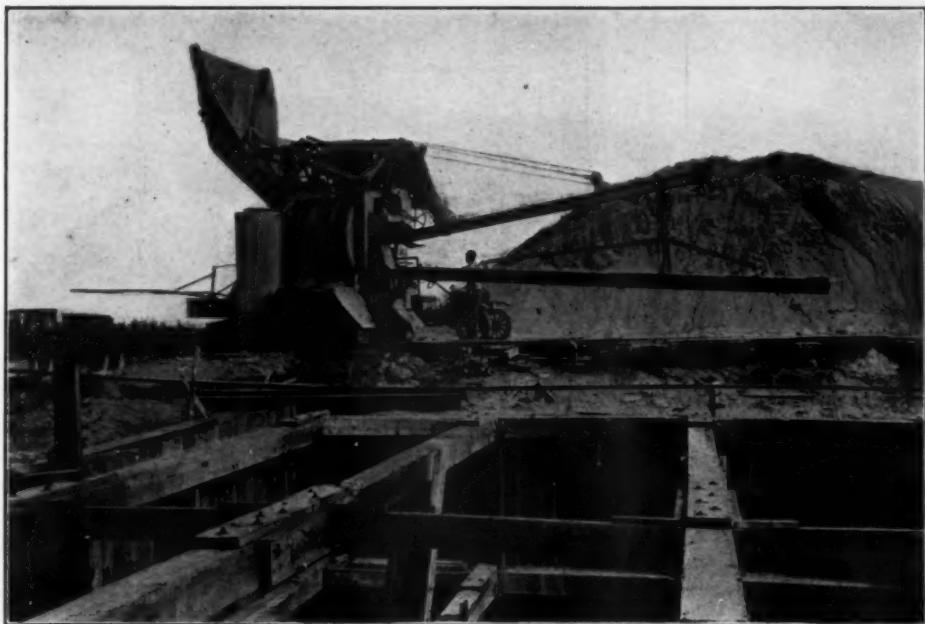
grade. The concrete was placed in the invert in 40-foot sections at the ends of which bulkheads were placed. The reinforcement bars were supported by these bulkheads. Radius form sections in the invert were used for the placing of concrete. When the invert had set for 24 hours, timber forms for the walls were set and the concrete poured and allowed to set for at least twenty hours before the roof forms were placed. The reinforcement steel was placed as the work progressed, the bars being bent to the required shapes by the hydraulic bender.

The roof concrete was allowed to set for at least three days. A small depth of wet back-

into territories where flooding has frequently occurred and will not be entirely abated until the sewer extensions have been placed in service.

Storm Water Overflow

At East 21st Street and Foster Avenue there was built a chamber so designed and constructed that the domestic sewage from more than 1,300 acres will continue in its old course to the foot of 64th Street in New York Bay, the storm water flow overflowing into the newly built East 21st Street sewer. This connection has already proved its usefulness. Although not entirely completed in early July, it received the storm water from an unusually



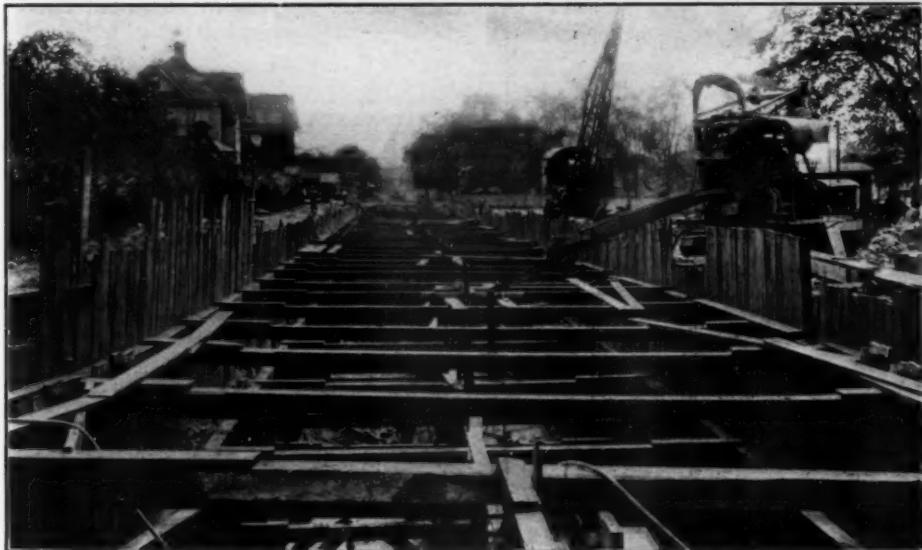
REX PAVER WITH CRAWLER MOUNTING ALONGSIDE SEWER EXCAVATION

excessive storm and prevented another disastrous flooding in Flatbush.

While work was in progress upon the upper section, operations were begun and carried on in the lower or outlet sections in three separate locations.

Construction of Lower Section

Trenches were excavated by means of steam shovels to almost half the depth of the ditch, which reached a maximum of 25 feet. The shovels discharged into motor trucks which entered the trench on ramps located at intervals



RANSOME CONCRETE MIXER POURING WALL BETWEEN TWO BARRELS OF SEWER ON AMERSFORT PLACE



INTENSIVE ACTIVITY ALONG LINE OF SEWER SHOWING P & H EXCAVATOR IN FOREGROUND, P & H CRANE AND INGERSOLL-RAND COMPRESSOR AT LEFT

of about 200 feet. When it became necessary to place sheeting, excavations by steam shovel ceased and further excavation down to sub-grade was done by crawler cranes on each side of the trench which excavated to a width of 5½ feet or 4 feet wider than the sewer section. This left a space of 2 feet on each side of the sewer which was used to convey the ground water to a sump 12 feet by 12 feet and 20 feet deep, sheeted with timber at the top and with

steel piling at the bottom. Broken stone (to a depth of 3 feet) was placed in the bottom of the sump, the top of the stone strainer being about 5 feet below the subgrade of the sewer. The depth of ground water, about 10 feet, necessitated constant pumping until the entire water table within a half-mile radius had been lowered. The water in the trench was then under control and was so maintained thereafter without interruption. The waterways



SUMP ON THE FLATBUSH RELIEF SEWER WITH ELECTRIC-DRIVEN CENTRIFUGAL PUMP DISCHARGING INTO SEWER AT HIGHER LEVEL

or side channels along the sides of the sewer section were lined with timber driven vertically below subgrade and surrounded by broken stone. At intervals of 30 feet double bulkheads were built transversely across the trench and were filled with broken stone which served to prevent the bottom from boiling or scouring and which directed the flow of ground water through the side channels to the sump. It had been anticipated that sumps would be required every 500 feet along Flatlands Avenue and Avenue I, but the side channels with cross-drains and bulkheads operated so well that they were able to convey the ground water for a distance of nearly 2,000 feet to the sump.

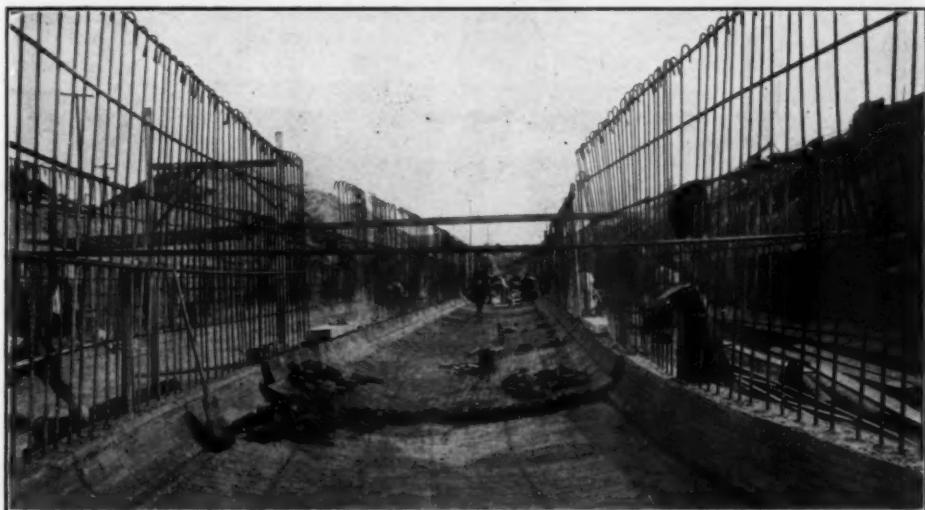
A second starting point of operations was in Schenectady Avenue at the site of a former sand pit previously excavated to ground water.

mixers moved along the streets and avenues and discharged their charges directly into chutes leading to the forms. Some of the forms were of timber and some of steel. These steel ones were three-barrel Blaw-Knox forms. The steel roof and wall forms were mounted on adjustable carriages.

The flow carried by the old Flatlands Avenue sewer was by-passed outside of the main trench to an arm of Paerdegat Basin into which the entire flow of the sewers is temporarily discharged.

Building the 198-Inch Sewer Under a Railroad

The 198-inch two-barrel sewer crossed under the Long Island Railroad at Avenue H near East 40th Street. The traffic upon this rail-



VIEW ALONG CENTRAL BARREL OF INVERT LOOKING SOUTH FROM AVENUE H, SHOWING VITRIFIED BRICK LINING AND REINFORCING FOR WALLS

From this point construction work was carried on down grade, which operation reversed the problem of caring for the ground water. In this operation sumps were established every 60 feet or less and the accumulated water was disposed of by electrically driven portable centrifugal pumps that discharged through steel pipes to an existing 120-inch sewer in Flatlands Avenue, which sewer was replaced by the work performed in this contract in that avenue.

The concrete for this section was mixed by a method similar to that used on the upper sections, namely in crawler types of mixers. There were two of the Oshkosh type, one Koehring paver type, one T. L. Smith paver type, and one Ransome paver type. These

road is perhaps the heaviest freight traffic in the world and special construction was resorted to in order that the railroad company's operations would not be hindered. The city obtained an easement across the right of way of the railroad for the construction of the sewer, and by special agreement the railroad company supported its system of four tracks for account of the contractor, who proceeded with his operations so as to fit in with those of the railroad. The locomotives and freight cars were of the heaviest type in use and available headroom did not permit the construction of any trusses spanning the sewer structure, which had at this location a width of thirty-seven feet and crossed the railroad at an angle of about 46 degrees. The 198-inch consisted



CONSTRUCTION WORK ON AVENUE I LOOKING WEST FROM FLATLANDS AVENUE, SHOWING TEMPORARY PLUME AT LEFT



CONSTRUCTION UNDER WAY ON CURVE IN FLATBUSH RELIEF SEWER FROM AVENUE H INTO SCHENECTADY AVENUE

of two barrels each 16 feet wide by 9 feet in height, separated by a partition wall 20 inches thick; the outside walls were also 20 inches in thickness.

Under the agreement the railroad company by its own forces drove bents of bearing piles under each rail, eight piles to a bent, with clusters of two on the outside of the sewer and with two piles within the space allotted for the 16-foot span of each section of sewer. Upon these piles were placed caps which in turn supported 24-inch I-beams for each rail. Squared ties were placed on top of the 24-inch beams and finally the rails were set at the proper elevation. When this work had been done by the railroad company the sewer contractor entered upon the ground, and made the necessary excavation to subgrade.

The piles were driven to a penetration of more than ten feet below subgrade of sewer. The center wall and side walls of the sewer were then constructed with mortices and with steel left protruding so that proper bond could be made with subsequent work. No pile work was needed for the sewer foundation as the

subgrade was firm sand. When the walls had set sufficiently to sustain a load—in about thirty days—the railroad company placed a steel grillage beam on top of the center wall and up to the 24-inch beam heretofore mentioned. The distance between the top of the wall as built and the bottom of the 24-inch beams was 22 inches. The 24-inch beam was wedged to bear on the grillage and then the intermediate piles were removed. Thereafter the sewer contractor completed the inverts of the sewer, placing more than the normal amount of steel reinforcement in order to insure complete union between the inverts and walls. The walls had been specially reinforced to serve as columns to bear the extraordinary loads brought by the locomotives and freight cars. The roofs of the sewer within the right of way of the railroad consisted of 15-inch I-beams encased in concrete having a thickness of 21 inches. When the roofs had set, the 24-inch I-beams were removed and the road reballasted directly on the sewer roof. These operations were performed with no delay to the railroad or to the sewer contractor.

Pump Supplies Water Over a Mile from Source

Hydrant Pressure Proves Inadequate on Road Construction, but Portable Pumper Makes Up the Deficit

THE R. D. Baker Construction Company, Detroit, Mich., has worked out a new method which greatly reduces the cost of carrying a large supply of water for some distance from the source of water to the point of use. This company is one of the large contractors carrying on extensive paving operations on the super-highways leading out of Detroit. On the particular job illustrated, water was needed a mile away from the storage source, which was a hydrant. It was found that the hydrant pressure was so low that the water would not flow up into a tank or barrel. The contractors mounted a Jaeger-Goulds pump on their Fordson tractor. With this they were able to do away with the expensive operation of hauling water in tank wagons for use a mile away. This was done by laying a mile of pipe, then connecting up the Jaeger-Goulds pump installed on the tractor with the hydrant and pipe line. They have also found that this outfit works equally well when they have to take water out of a stream or ditch,

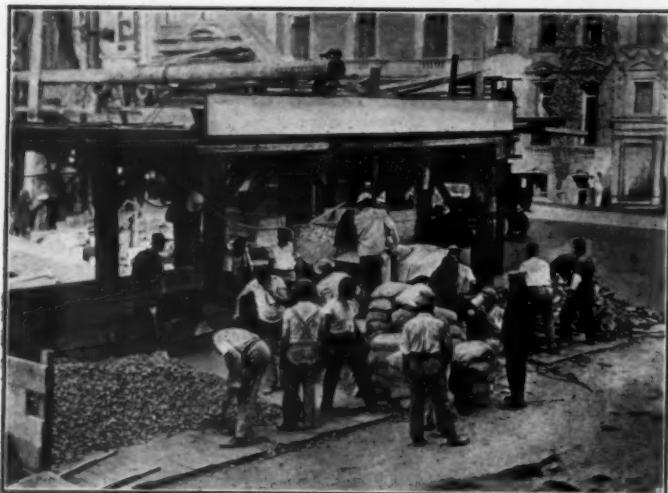


BOOSTING THE LOW HYDRANT ON A ROAD JOB

because of the high pressure developed by the pump. They found also that this new method of transporting water for a considerable distance costs only a fraction of the cost of hauling water.

The right kind of sand is cheap. The wrong kind is the costliest thing on earth.

Contractors Can Maintain the Attractiveness of Streets During Construction



This is the way all contractors formerly handled building construction on important thoroughfares.

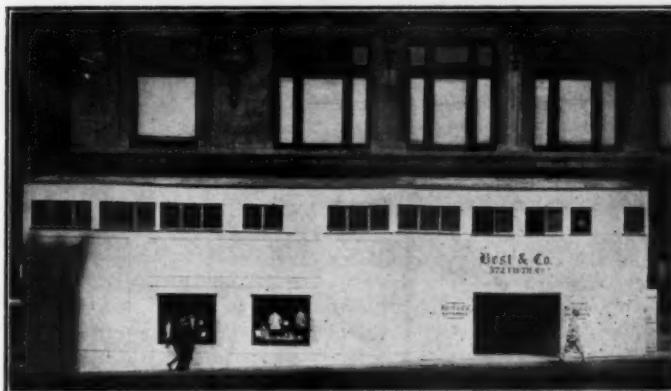
Fortunately most builders have given up such methods and now use screens of one type or another, as shown below and on the following page, to mask the operations somewhat from the public eye

The advantages of attractive screens for construction operations are obvious, as they reflect credit and increase public respect for the builders, owners and tenants, and, in fact, every one connected with such a job. Practices of this sort do a great deal to improve and maintain the character of business and residential streets and consequently to enhance the investments which are represented by new buildings



W. RICHARD DAVIS & COMPANY
USED THIS METHOD OF PRESERVING
THE APPEARANCE OF FIFTH AVENUE,
NEW YORK

AT LEFT, MASKING A STORE ALTERATION FOR
CANADIAN NATIONAL RAILWAYS



A RECENT
SHOW-WINDOW
ALTERATION BY
BEST & CO.,
NEW YORK

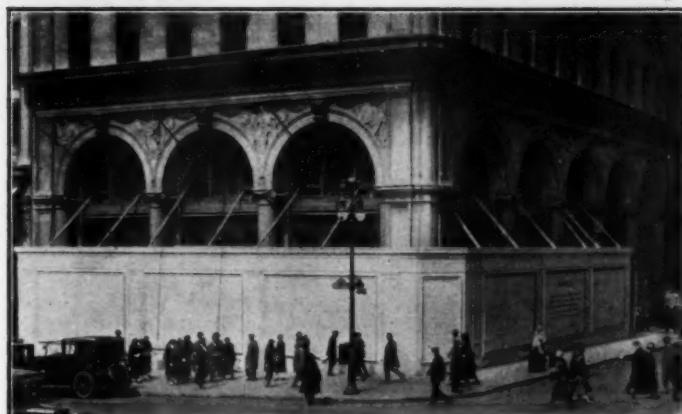
BELOW, BUILDING THE NEW HOME OF
JAMES McCUTCHEON & CO.



THIS PLATFORM PROTECTS THE SAFETY OF THE
PEDESTRIANS AND PRESERVES THE ATTRAC-
TIVENESS OF THE SITE DURING CONSTRUCTION

AT RIGHT, ANOTHER
EXAMPLE OF REAL
CIVIC THOUGHT
Neatly masked
construction and
alterations deserve public
gratitude.

Photographs courtesy
of Fifth Avenue Assoc-
iation, New York



Rock Excavation for Apartment Building in New York City

By DANIEL J. HAUER
Construction Economist, New York City

A LARGE construction or building job is impressive to watch or to describe and it has a certain value to watchers and readers, but few contractors or engineers are engaged on the largest jobs in the country, while thousands are continually carrying on to completion various kinds of undertakings that are of average type and size. It is for this reason that a description is given of an excavation for an apartment house located on West 70th Street, near Broadway, New York.

In order to make room for this new structure, five dwellings were demolished, leaving a lot with about 110-foot frontage and about 100-foot depth. This foundation excavation, now nearing completion, has been exceedingly well managed, which, in the writer's opinion, is not always the case. Three buildings on the west end of the lot were first demolished. The dwellings were four stories high with the basement a little below the street level and a sub-basement or cellar. These three houses were torn down and the building material hauled away, even the sub-basement walls being pretty well cleared away to the foundation footing. Then a heavy plank runway or incline was laid on heavy cribbing and supports of old timber on the west end of the lot. At this stage of the work a Thew steam shovel was brought to the job and taken down the runway to the sub-basement. At almost the same time work on demolishing the other two buildings was started. Demolition was pushed while preparations were being made to start the steam shovel excavation.

On Manhattan Island, New York City, excavation south of Fourteenth Street, running to a depth of about 115 feet at the lower end of the island, is through soft materials, clay, sand, and gravel, while north of Fourteenth Street the rock, a mica schist, comes close to the surface and in many places before buildings were constructed this rock outcropped or stood above the ground surface in huge boulders or ledges. The surface of this mica schist is very irregular and on top are frequently found large pockets of clay and other glacial deposits. Thus, unless soundings have previously been made, it is difficult to tell how much earth excavation can be made on a job of this character with a power shovel. When the amount of work of this type is small and

uncertain many contractors make excuses for not using machines for their work, electing to employ hand methods, claiming that it is cheaper to do so. Based upon a large number of records and comparisons, the writer believes this is a fallacy and that even for small quantities of work machines are not only quicker but cheaper. One factor of cost that must be reckoned is the overhead saved by doing the work faster; but, unfortunately, as few contractors or builders figure their overhead until a job is finished, this important cost is seldom considered.

On this job, the contractor, an able and experienced excavator, showed excellent judgment in handling the work as he did and in putting his shovel on the job. He was able, by using this machine, not only to clean up the old foundations of the three buildings already wrecked and to excavate the earth down to bed rock, but, also, after the other two buildings had been torn down to the top of the sub-basement or about the street level, to use the power shovel to demolish the rest of the walls, loading directly into 5-ton Mack trucks which were used for hauling the débris and excavated material. This made additional work for the steam shovel, justifying its use, and it certainly saved money over tearing down the walls and taking up the heavy foundation stones and stone steps by hand.

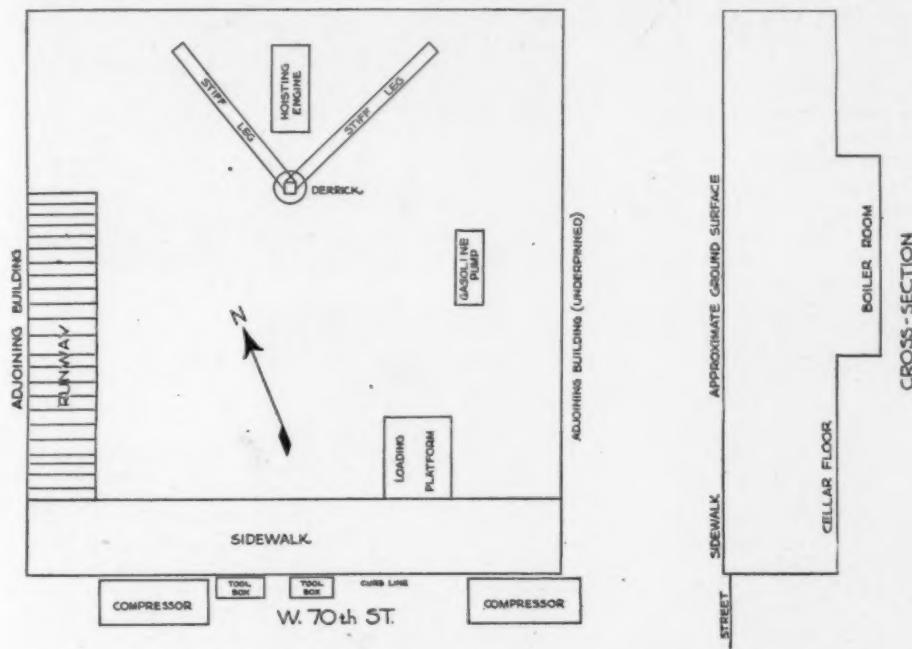
There can be only one objection put forth to this method, namely, the wasting of some of the old building material. The writer does not know whether or not this old material was saved in this case, but under most conditions old brick and building stone could be salvaged at the place where the trucks are dumped at much less cost than on the building site. Thus the shovel is given additional labor-saving work, lasting from one to two weeks, to justify its installation.

Several days before the shovel finished its work, an electrically operated air-compressor was brought to the job and placed in the street alongside the curb and a temporary connection was made with the Edison Electric Company's power line. This portable air plant is to be commended as a modern, economical piece of contractor's equipment. The plant consists of an Ingersoll-Rand 14 x 12 air-compressor, with a 90-foot air tank operated by a Belyea

type-S. K. 230-volt, 100-horsepower electric motor, with a Cutler-Hammer switch and control, and is mounted on solid rubber-tired wheels and has a neat and rather ornamental house built over it. The entire outfit is so built that it can be moved easily by a truck from one job to another. It is compact, well-designed and protected from the weather. If it is necessary to work the plant at night, electric lights are at hand to be used. The air is supplied from the plant by a 2-inch line. After the drilling and rock blasting was well under way, an auxiliary air plant of the same general type but not mounted in the same manner was moved to the job.

feet in depth. A wooden tool-box was furnished for the exclusive use of the drill runners, while a similar tool-box was used for the other tools. A small chest was provided for the hoisting engineer, while a chest was also furnished for the air-compressor. Two small metal chests painted red were provided for storing dynamite.

As soon as the shovel finished its work it went up the runway and left the job and by that time the derrick had been set up, and with two steel skips no time was lost in starting the rock excavation. As the rock work was carried on, the adjoining buildings had to be underpinned. Underpinning is done extensively in New York



Before the Thew shovel had finished its work an American stiff-leg derrick was brought to the site of the new apartment and set up on the back or northern part of the lot. This derrick had two stiff legs set upon timbers running from the 35-foot mast to platforms upon which heavy rocks from the excavation were piled. A 10-foot bull-wheel for swinging the 65-foot boom completed the derrick, which was operated by a Lidgerwood two-drum and derrick-swing hoisting engine. The power equipment was a General Electric 125-horsepower, 230-volt motor, with G. E. control and switch.

The drilling was done by Ingersoll-Rand jackhammers driving holes up to about 10

feet in depth. A wooden tool-box was furnished for the exclusive use of the drill runners, while a similar tool-box was used for the other tools. A small chest was provided for the hoisting engineer, while a chest was also furnished for the air-compressor. Two small metal chests painted red were provided for storing dynamite.

The holes drilled from 7 to 10 feet in depth were shot in series with Du Pont dynamite and were covered over with large wire mats to keep the rock from being thrown out by the blast. This precaution is required by a city ordinance. These features were similar to those

of other jobs continually handled in the city and need little comment. The excavation was carried to a depth of about 18 feet below the street level and in one place where the boiler-room is to be located the rock was taken out to an additional depth of 8 or 9 feet.

After the greater part of the rock was excavated the runway was taken up so that the rock under it could be taken out. Near the southeast corner of the lot when the excavation was already finished an elevated platform on the street level was built for the trucks to be backed up onto and then loaded by the derrick with the skip.

Good management was shown in the number of skips—fifteen in all—used on the work. Enough men were employed to load from ten to twelve of these skips at one time. This meant employing a large fleet of trucks. The quicker a job of this character can be done the lower the overhead charges, which amount to a considerable daily sum, and thus a greater profit can be assured.

The large number of skips (three skips made a truckload) meant that trucks were loaded promptly. As a rule there were at least two skips ready to be dumped so that trucks came to the job and left with great regularity as rapidly as three skips could be handled. This

is a great consideration in reducing unit costs of excavation. Trucks, especially hired trucks, are worth from \$3.50 to \$5.00 per hour, so that every minute that trucks must wait to be loaded means money wasted. On this job, this item of waste was small except at the start in the morning when the entire fleet of trucks came to the job at the starting hour. With a number of skips emptied the last thing the afternoon before, it is an hour or more before all the trucks are loaded and become spaced out and are returning from the dumps with some degree of regularity. This morning delay is difficult to eliminate with hired vehicles, as it is usually not possible to hire trucks except for a full day and there are no other odd jobs, as a rule, that they can be put to work upon until they are needed to handle the excavated material. This is one subject for close study for every contractor handling this class of work, and it is only by such careful study and records that lost truck-time can be eliminated. This job was far from ideal in this respect, but was such an improvement over many other jobs the writer has seen of late that it found decided approval.

The contractor for the work described was the George J. Atwell Company, Inc., 347 Madison Avenue, New York.

Making Use of the Midnight Sun in Winter Construction

By R. C. DUNCAN
Carbie Manufacturing Company, Duluth, Minn.

AT this season of the year, particularly as the days grow shorter and with the coming of the first tinges of frost and crispy air, contractors everywhere give thought to the speeding up of their work for the purpose of avoiding the inclement weather that usually comes between now and the winter freeze-up.

One way in which operators are beating Jack Frost is by adding a few extra working hours to each day by the use of portable acetylene flare lights. These lights, being strictly portable units, can be moved from place to place as the job progresses and because of their flexibility the light from them can be thrown in any direction or adjusted to any angle, either vertical or horizontal.

The use of a powerful portable light of this kind has been the means of removing a great deal of the old antipathy that many contractors had for night operating. For, with a dependable unit the same speed and safety that attends day operation is obtainable.

For some classes of work, night operating is really more desirable than day work. For example, the laying of pavements can be better accomplished after dark by the use of a concentrated light than it can be in the daytime, as every small depression casts its shadow and is detected more easily than in the daytime. Every one who has driven an automobile knows how much more clearly the unevenness in the road is depicted at night by the use of artificial light than in the daytime.

Another thing in favor of adding a few extra hours of operation after the sun goes down is the extra use that is obtained from the equipment. This should be considered as very important, for every long-headed operator knows that expensive equipment while lying idle simply "eats its head off" in depreciation. He also knows that the more hours his equipment can be used the less the overhead on it and likewise the more profit there accrues from its ownership.

The number of lights to be used depends largely on the size of the job and the number of men employed. One contractor may use two lights, one stationed at each end of the work to avoid cross shadows, while another may use as many as seven at each mixer. In the latter case one is set to direct its light where it will be of most benefit to the man engaged in making the batch transfer, one is set to illuminate mixer operation, one for the special

of the night shift includes a hot lunch about 10 P.M., but the men usually eat this in relays so as not to stop work.

It is a known fact that many workmen will produce better results on the night shift than during the day. There is nothing to distract their attention from their work and the men working in the cool and refreshing night put the best they have into production. There is no doubt that night work is present-day



THREE ACETYLENE
LIGHTS MAKE POSSIBLE
THE HANDLING OF
ROUGH GRADING
ON RUSH JOBS
AT NIGHT

THE FLOODLIGHT
MAKES POSSIBLE THE
CONTINUANCE OF
HEAVY DRAGLINE
WORK FAR INTO
THE NIGHT



use of the men working with the finishing machine, and the others are distributed along the sides of the roadway wherever they are needed.

In arranging the labor schedules for night operation, it is common to arrange two eight-hour shifts for the mixer crews, 7 A.M. to 4 P.M. and 6 P.M. to 2 A.M. The schedule

economy and efficiency. Furthermore, there is no doubt that acetylene lights, because of their simplicity, efficiency, portability, and economy, are the most up-to-date means of supplying the lighting needed. Road building at night requires good light; and unless good light is obtained, construction work is bound to fail.

Highway Construction on the Buffalo Trail in Minnesota

By F. H. A. NYE

ALARGE portion of the state of Minnesota consists of extensive prairies of a much higher elevation than that portion of the state lying along the Mississippi River which is the eastern borderline of the state. To enter the state from this river valley the traveler must pass up a long ravine or river valley to a higher elevation. The highways as first built followed the easiest grades and in very many cases were much longer than would have been necessary if the early builders had not considered cuts and fills too expensive.

State Highway No. 9, which leads westward from La Crosse, Wis., and which is called

No. 9, is not usually a stream of much size, but as it drains a large area and in case of extensive storms sometimes rises and overflows its banks, a bridge has been built which spans what is most of the time a practically dry bed or very small stream.

One of the interesting undertakings on this project was the construction of a bridge beside a creek at a considerable distance from all highways, necessitating very difficult transportation of materials. This bridge has solid concrete piers and very substantial steel girders which were difficult to transport. For some of the distance they were moved or skidded



A LARGE BRIDGE FOR A SMALL STREAM MADE NECESSARY BY FLOOD FLOWS AT CERTAIN TIMES OF THE YEAR

the Buffalo Trail, extends through Hokah, Houston, Albert Lea, Austin, and Worthington, Minn., and Pierre and Rapid City, S. D., becoming Highway No. 34 at that point and leading into the Black Hills and National Forest. The State Highway Department is making extensive improvements between Hokah and Houston, leaving the old highway and taking a new and shorter route for most of the distance, thereby saving about three miles. This new route involves the construction of eleven concrete bridges at a total cost of \$92,994.84. The bridges range from a 30-foot I-beam type to a 75-foot span, low-truss type bridge. There are forty-six standard monolithic concrete culverts, ranging from 2 x 2 feet to 10 x 6 feet, being built at a total cost of \$31,276.40.

Root River, which is followed by Highway

over such obstacles as were in the way. The bridge is built just a little out of the bed of the creek, which will be turned later to give a straighter line of flow.

The rough nature of the ground is shown in the construction of many of the culverts. Some of the culverts are built on such a steep grade that it was necessary to haul the gravel and cement to some point at a considerable distance above the spot where the culvert was to be built and then slide or chute the sacks of cement, aggregate, and the steel reinforcement down to the work. The tops or upper openings of some of these culverts are as much as 20 feet higher than the lower openings and in some places the grade will be several feet higher than the upper opening because of fill. Some of the culverts were built at a cost of as



THE ERIE SHOVEL LOADING A MACK TRUCK ONLY A FEW HOURS AFTER THE SHOVEL HAD BEEN ALMOST OVERCOME BY A LANDSLIDE

much as \$16.80 per cubic yard of concrete.

The surface has now been broken and grading begun on a large portion of the route, but

there are still some portions where the stumps and trees are yet to be removed.

The contract calls for the excavation of 460,-



CULVERTS IN HILLY COUNTRY BUILT PRIOR TO FINAL GRADING AND FILL



BRIDGE ABUTMENT AND SUPERSTRUCTURE COMPLETELY ASSEMBLED ALONGSIDE CREEK BEFORE COURSE OF STREAM WAS CHANGED TO IMPROVE FLOW

000 cubic yards of material, about 80,000 yards of which is solid rock. The grading contract was let to Frederick Barnard Sons Company, Minneapolis, Minn., for \$192,340.15. The work was begun early in the construction season of 1925 and continued up to January 15, 1926, when it was discontinued until early in April. Portions of the work have been sublet to various contractors, the most extensive portion being handled by Baumgartner and McNamamy, Minneapolis, whose outfit consists of a $2\frac{1}{2}$ -yard Bucyrus steam shovel, two small steam industrial locomotives, and twenty or more

cars, with about a mile of narrow-gage track. The shovel is of the railway type, requiring the construction of a standard track from the nearest railroad to the job.

Some portions of the work call for excavating dirt in high banks. The soil was of such a character that there were frequent slides, many times nearly submerging the steam shovel. When this did occur, the shovels dug themselves out quickly. One of the illustrations shows an Erie steam shovel which met with such an experience just completing the job of digging itself out and loading one of the fleet



A NORTHWEST SHOVEL MAKING QUICK WORK OF A HEAVY CUT



NOONTIME FOR THE MULES

of Mack trucks which handled all of the hauling on this section.

During the winter, some portions of the work proceeded more favorably than in hot weather—first, because the men and horses could work more comfortably, and, second, because the gasoline and steam shovels could readily take up a foot or even 18 inches of frozen dirt and break it up into pieces which could be easily loaded into the dump-wagons.

The cost of excavation at the east end of the project near Hokah, where the cut extended 15 to 20 feet, averaged about 40 cents a cubic

yard, while at points of the line where limestone was handled, the cost of excavation was \$3.00 per cubic yard.

Construction Camp and Field Kitchen

Each contractor maintains a camp where the men and animals are cared for with comfortable sleeping tents, kitchens, and dining places. During July, the Barnard outfit was operating a shovel and 13 dump-cars about two miles from the camp. In order to expedite work the noon meal was brought from headquarters to a cool grove just back from the line of the



THE MEN HALT IN THE SHADE FOR THEIR NOON MEAL

highway. Here, after the mules and horses were watered and fed, the cook set up a sumptuous meal on a large table, the men passing with their plates and taking such food as they wished and going out into the shade to eat in comfort.

Conclusion

The improved highway is 13 miles in length, has a width of 32 feet, and will be covered with clay using 60 cubic yards of clay per 100 feet

of roadway. This coat of clay is necessary for the support of the gravel road-bed which will be laid under another contract.

The work is under the supervision of C. D. Conzett, Resident Engineer, who, with his fourteen assistants, has an office at Mound Prairie, a small village near the center of the project. Mr. Conzett has the ability to secure the cooperation of contractors in getting first-class results and at the same time to make himself of service to the contractors.

Why Air-Cleaners on Gasoline Engines Soon Pay for Themselves

By G. S. HAMILTON

Climax Engineering Company, Clinton, Iowa

If the gasoline engine on your tractor, crane or other equipment is operating under dusty conditions, some provision should be made for cleaning the air that enters the engine through the carburetor. Air-cleaners will pay for themselves by reducing the up-keep cost of the engine. They will keep down repair bills, thus saving you real dollars and cents.

As you know, the carburetor mixes gasoline and air in correct proportions. This mixture is induced into the cylinder heads, where it is exploded. If the air which is brought into the cylinders is dusty, these foreign particles work their way around the pistons and piston rings, acting as an abrasive. Wear results.

Dirt also works down into the oil sump, where

it mixes with the lubricating oil. Sludge forms in the oil pan. This thick, heavy mass of oil and dirt collects around the oil-strainer, clogging it and retarding the flow of oil through the lubricating system. Sometimes it so decreases the flow of oil that the bearings are not properly lubricated, with the result that they burn out.

It will be seen that dust has a disastrous effect on the engine as a whole. Not one part, but all, are affected; repair bills become evident; and the engine becomes an expense rather than an investment.

There are a number of good air-cleaners on the market. If you do not know their names, the manufacturer of the gasoline engine you are using will gladly make recommendations.

Stucco Overcoats

Use of This Material Rapidly Growing as a Means of Improving Houses Already Built

THOSE who have made a careful study of the value of stucco as an outside covering for residences have put forth eight special reasons why wooden frame houses should be classed in stucco overcoats:

1. Overcoating eliminates the need of a protection for wood, as stucco is man-made stone with a permanent color and texture.

2. A stucco overcoat eliminates repairing. Since stucco is man-made stone, it is durable and will last practically indefinitely without requiring attention.

3. A stucco overcoat is warmer in winter because, being cast into place, it is a continuous monolithic covering of dense, non-porous stone. Window-frames and door-frames remain air-tight and water-tight because they are actually cemented in place.

4. A stucco overcoat is cooler in summer because

stucco has great insulating value. Being dense, it throws off rather than absorbs heat and light rays.

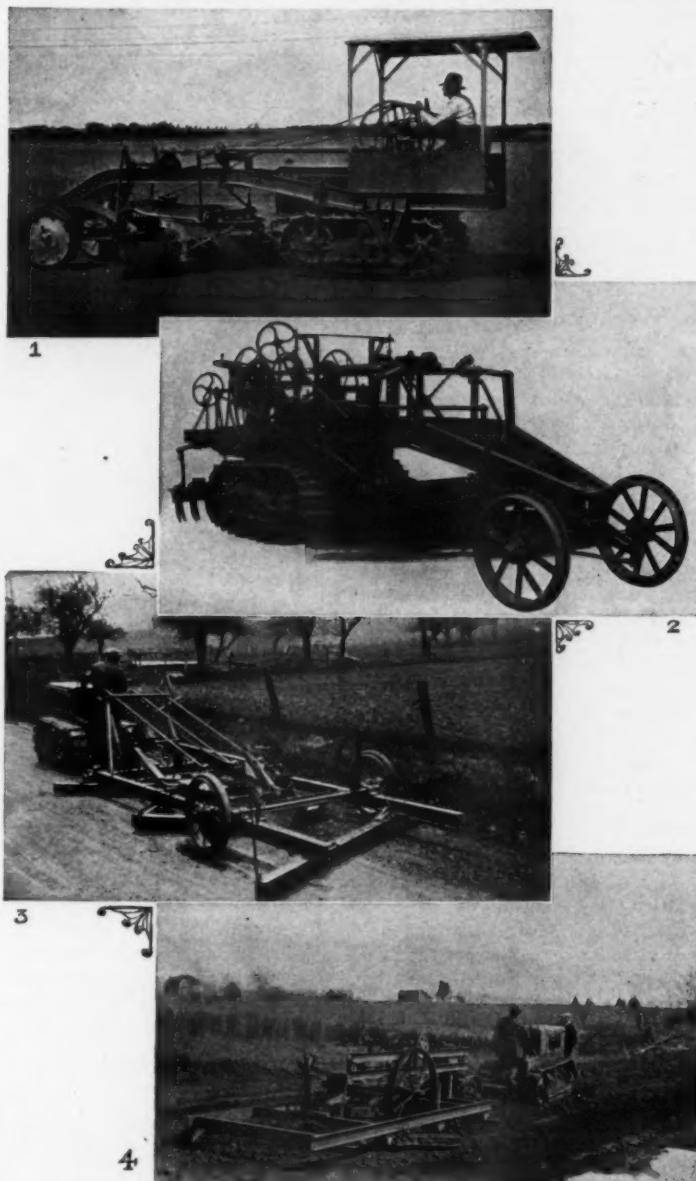
5. Overcoating lowers the cost of heating because each pound of coal or gallon of oil or cubic foot of gas gets full credit for the heat it generates. The heat "stays in" in an overcoated house.

6. A stucco overcoat is fireproof because stucco walls are actually a continuous one-piece surface-covering of stone cast into place.

7. The beautiful, warm, mellow appearance alone of stucco will enhance the value of the house from 50 to 100 per cent. This is aside from the direct influence upon property value covered by the prior six reasons.

8. A stucco overcoat gives personal satisfaction—satisfaction in the property as a whole and in the home in particular. This is probably the foremost reason for the use of the overcoat.

A Line-Up of Patrol Graders and Maintainers



FOUR PATROL GRADERS OF THE ONE-MAN TYPE USING 2-TON CATERPILLAR TRACTORS FOR MOTIVE POWER

1.—The Russell Motor Patrol No. 4 made by the Russell Grader Mfg. Co., Minneapolis, Minn. 2.—The Spearwell Big 8 Grader made by the Spears-Wells Machinery Co., Inc., Oakland, Calif. 3.—The Adams One-Man Road Maintainer made by J. D. Adams & Co., Indianapolis, Ind. 4.—The Baker One-Man Automatic Road Maintainer made by the Baker Mfg. Co., Springfield, Ill.

An Efficient Commercial Concrete-Mixing Plant

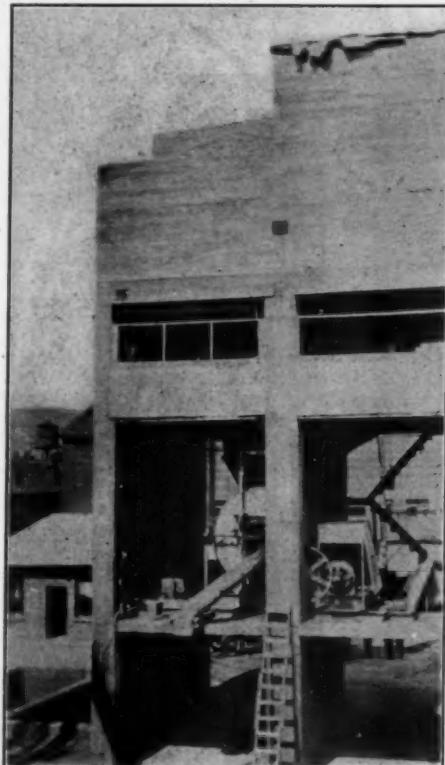
Pittsburgh Plant Has Capacity of 1,000 Cubic Yards of Concrete and 100 Tons of Mortar per Working Day

THE Ready Mixed Concrete Company, South 22nd Street and P. & L. E. R. R., Pittsburgh, Pa., started operations May 1, 1925, with a mixer having a capacity of 1 cubic yard. The demand for the product of the company by the first of 1926 compelled the erection of a new plant, and on June 1, 1926, they placed in operation a new unit having three times the capacity of the original plant.

The new plant is equipped with a special 84-S Ransome building-type concrete mixer which is said to be the largest concrete mixer in use in the United States, mixing a 3-yard batch of concrete. The idea in using such a large mixer is to cut down the waiting time of trucks, which are now loaded in one-third the time that it took from the old-style 1-yard plant. This new 3-yard mixer discharges in less time than the old 1-yard tilting type mixer. The plant also uses Blaw-Knox weighing batchers to insure accurate batches.

The Ready Mixed Concrete Company uses a fleet of 5-ton trucks hauling 3 yards of concrete. A special-built truck is used for hauling the concrete, discharging the concrete through the bottom of the truck.

This organization is today probably the largest ready mixed concrete plant in the world, and in addition it is manufacturing a new product, Ready Mixed lime mortar, which has proved popular. Ready Mixed concrete is approved for use by the city of Pittsburgh and the county of Alleghany Departments of Public Works and by the Bureau of Building Inspection of the city of Pittsburgh. Many of the largest construction organizations in Pittsburgh are constant users of the products of the Ready Mixed Concrete Company, among them the Jones and Laughlin Steel Corporation, the Boyle-Robertson Construction Company, the J. Toner Barr Company, and the Vang



VIEW OF THE WORLD'S LARGEST COMMERCIAL CONCRETE MANUFACTURING PLANT

Construction Company, contractors for the Liberty Bridge.

The Ransome 84-S standard building-type concrete mixer was sold to the Ready Mixed Concrete Company by the Ruane Machinery Company, Pittsburgh, Pa.

Playing Safe

SUPPLEMENTARY or stand-by equipment is being looked upon with more and more favor as a moderate premium paid for business insurance. It need not go to the length to which it was carried by one business man, who insisted on having an entire duplicate plant, completely equipped, ready at hand in case of fire or other disastrous occurrence. But equipment "just a little more complete than seems necessary"—to paraphrase

an old business slogan—is found to be well worthwhile.

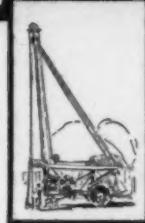
In the handling of rough and heavy materials, even the sturdiest of devices ages rapidly, and an extra digging unit, or whatever it may be, gives the foresighted producer a safe and comfortable feeling which he can get in no other way.

Then there is additional and supplementary work which such equipment can often do, just to pay for itself as it goes along. —*Sauerman News*.



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Hercules Engines are not only
so rugged as they look
—and so sturdy as the name implies
—but always they deliver all the
operator expects—and more!



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Legal Points for Contractors

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

Edited by A. L. H. Street, Attorney-at-Law

Contractor's Liability for Injury to Employee

Dealing with a contractor's liability for injury to an employee, not covered by a workmen's compensation act, the Mississippi Supreme Court decided in the case of *Veney vs. Samuels*, 107 Southern Reporter, 517, that to create liability of employer for injury received by employee while unloading gravel truck, because of defective dumping apparatus, it was not necessary that the employer should have anticipated the particular injury that resulted, but only that an injury of some character might result therefrom.

Negligent Operation of Trucks on Highways

One operating a truck on a public highway in the night-time without headlights on it, as required by statute, and thereby causing injury to another traveler on the highway who was in the exercise of reasonable care for his own safety, is liable for consequential damages, according to the decision of the Appellate Court of Indiana in the case of *Fisher vs. Maxwell Gravel Company* (151 North Eastern Reporter, 618).

Responsibility for Independent Contractor's Negligence

A bridge company, having constructed a reservoir for a city, arranged with one Guthrie to remove scaffolding, he to have the material for his work. Guthrie furnished all the necessary labor. One of his employees was injured and sought to hold the bridge company liable. Holding that the company was not liable, the Kentucky Court of Appeals said in the case of *Marsh vs. Nashville Bridge Company*, (279 South Western Reporter, 1099):

"Clearly Guthrie was an independent contractor and the bridge company would not be liable for the manner in which he removed the scaffold, unless it owed a non-delegable duty to adopt 'recautionary measures for such removal. If the scaffold was erected at a place where its removal was necessarily attendant with danger to third persons in the vicinity, it would have been the duty of the bridge company to adopt measures for their safety, and this duty would be non-delegable. But the rule does not apply here. The various parts of the scaffold were open and visible, though its removal was necessarily attendant with some hazard. In voluntarily accepting employment on this work, appellee [plaintiff] assumed the attendant risks consequent upon its proper removal by his employer, and the bridge company is not liable for the manner in which the removal was effected."

Responsibility of Highway Contractors to Motorists

While driving an automobile about 20 miles an hour, plaintiff turned abruptly to the right on a detour and went into a ditch. He sued the county and a contractor engaged in constructing a highway, claiming that a barrier should have been maintained at the point where the accident occurred. He recovered judgment in the trial court, but the Wisconsin Supreme Court set it aside and ordered dismissal of the suit for reasons stated as follows (*Buckley vs. Washington County*, 207 Northwestern Reporter, 558):

"It is held that the defendants were guilty of no want of ordinary care in failing to maintain a barrier at the side of the road at the point in question. No law required them to maintain such a barrier. . . . In any event, a traveler proceeding at the rate of 20 miles an hour, making a sudden abrupt turn to the right on a road which he knows is under construction, must be held to be guilty of contributory negligence as a matter of law. . . .

"Contractors and the public authorities are not insurers of the safety of travelers, and the plaintiff, under the circumstances disclosed by the facts of this case, was bound to exercise care for his own safety. This is not a case where the traveler slid into the ditch or was thrown from the highway by an obstacle, but one where he deliberately and intentionally departed from the traveled track for no other reason than that he was following a wheel track, or rut, as he described it."

Rights of Copartners

Important rules of law applying to the rights of members of a partnership were laid down by the West Virginia Supreme Court of Appeals in the case of *Lutz vs. Miller*, 133 South Eastern Reporter, 633, as follows:

When a partner retires from a firm, it is his duty to see that notice of such retirement is given to those who have been dealing with the firm. If no such notice be given, the retiring partner is generally treated at law as still a member of the firm and is liable as such.

One who knows he is being held out as a member of a partnership and takes no adequate steps to notify those dealing with the firm to the contrary may be held liable as a partner to those who extended credit to the firm on the faith of his reputed relation to it.

A partner cannot repay himself out of the firm's assets for advances made the partnership, except with the assent of his copartners, expressed or implied, and not then until the general creditors are paid.

BULL FROG WHEELBARROWS



Here are some of the reasons why the Bull Frog No. 25A contractors' barrow delivers more service value per dollar of price and more work per dollar of labor cost:

The seamless tray with the high front balances the load easily and dumps easily and cleanly. The long handles with shaped grips give the user absolute control and ease of operation.

The high risers put the burden on the easy-running Never-Break wheel.

The angle iron leg extension along the handles, and the malleable iron shoes give long life at important points.

This barrow includes everything we have learned in years of wheelbarrow manufacturing. See your jobber or write us about it. We will gladly send our new catalog to any contractor. It describes Bull Frog barrows, carts, and scrapers for all factory, mill, mine, contracting, and industrial use.

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Validity of a Verbal Promise to Pay Another's Debt

In nearly all, if not all, the states there is in force a law known as the Statute of Frauds, under which certain agreements are not enforceable unless evidenced by a writing signed by the party sought to be held. One of the classes of agreements covered by the statute is an agreement by one person to pay the debt of a second party. But it is universally held by the courts that where a consideration moves to the promisor the statute does not apply. This qualification is illustrated by the recent decision handed down by the Alabama Supreme Court in the case of *Glenn vs. Newell Contracting Company*, 107 Southern Reporter, 801. In that case defendant was a general highway contractor and plaintiff was employed by a subcontractor. Holding that defendant was liable to plaintiff, the Court said:

"While performing a part at least of the work for which plaintiff claimed a recovery, he was not in the employment of defendant—his case was that he was employed by a subcontractor, that he was about to abandon the work because he was not being paid according to his agreement, when defendant, for whom the work was being done, promised to pay for the part already done and as well that remaining to be done if plaintiff would carry on the work to a finish, and that, in consideration of this agreement, he completed the work. On this showing, if accepted by the jury, as it well may have been, plaintiff was entitled to recover. Defendant suggests the Statute of Frauds; but we think it inapplicable, because the promise to pay by defendant was upon a new and valuable consideration, beneficial to the promisor, the defendant."

Subcontractor's Rights on General Contractor's Insolvency

As against a city which awarded a contract for the erection of a school building, insolvency of the general contractor did not relieve a subcontractor from performance of his contract, according to the holding of the New York Court of Appeals in the case of *Dwelle-Kaiser Company vs. Aetna Casualty & Surety Company*, 150 North Eastern Reporter, 517. The subcontractor merely became entitled to insist upon cash payment, in lieu of extending the credit contemplated when solvency of the contractor had been assumed.

Right to Interest on Overdue Claims—Personal Liability of Contracting Partners

Where the amount due under a construction contract is a mere matter of computation, as distinguished from an unliquidated claim such as arises under breach of a contract or commission of an actionable wrong, interest should be allowed on the amount from the time the principal sum fell due, held the Washington Supreme Court in the case of *Barbo vs. Norris*, 245 Pacific Reporter, 414. In the same case it was decided that where a partnership is indebted under a contract judgment may be obtained against the partners personally as well as jointly. This holding follows the general rule of law that partners are jointly and severally liable on the firm's obligations.

Validity of Extended Time for Completing Municipal Work

As against a complaining taxpayer, a city council may extend the time for completing work under a paving contract, held the Kansas City Court of Appeals in the case of *Mound City vs. Shields*, 278 Southwestern Reporter, 798.

Workmen's Compensation for Death of Employee While Making Criminal Assault Denied

A construction company's employee was killed by his superintendent in self-defense while the employee was making a murderous assault to induce immediate payment of his wages. Under these circumstances the Pennsylvania Supreme Court decided (*Curran vs. Vang Construction Company*, 133 Atlantic Reporter, 261) that the employee's widow was not entitled to an award under the Pennsylvania Workmen's Compensation Act, on the theory that the accident arose in the course of the employment. The decedent was held to have abandoned his status as an employee and become a criminal.

The Supervising Engineer as a Court of Last Resort

Perhaps, no construction contract was ever more strongly worded to confer full powers upon a supervising engineer to determine controversies arising between owner and contractor than the contract involved in the case of *E. H. Smith Contracting Company vs. City of New York*, 148 Northeastern Reporter, 655. And yet the New York Court of Appeals, the foremost state tribunal of the country, failed to see in it any quality which bound the contractor by the engineer's manifestly erroneous decision. The contract, which, in part, called for construction of concrete arches for an elevated railroad, recited:

"To prevent disputes and litigations, the engineer shall in all cases determine the amount, quality, acceptability, and fitness of the several kinds of work and materials . . . shall determine all questions in relation to the works and the construction thereof, and shall in all cases determine every question which may arise relative to the fulfilment of this contract on the part of the contractor." Etc.

Controversy arose as to the propriety of the engineer's classification of altered work, and the Appellate Division of the New York Supreme Court ruled that the clause above quoted in part made the engineer the final arbitrator, but the Court of Appeals reversed the conclusion, saying:

"Assuming that . . . the question as to whether such work is susceptible of classification under the schedule of unit prices is to be submitted to the engineer, we still think that this action may not be sustained. If his certificate is a condition precedent to payment, it still may not be arbitrarily withheld. So if his action involves an erroneous construction of the contract. If it appears that there is no reasonable basis whatever for his action, if it is patently erroneous, then we find the equivalent of bad faith upon his part, and the contractor is not bound by his decision."

Milwaukee Public Works Has Full Waukesha Engined Equipment



Selects Waukesha Equipped Machines

Milwaukee chose Sterling Trucks and Universal Cranes for their public works. Both trucks and the crane illustrated here have the same sizes engines. More than fifty of the trucks, cranes and fire engines owned by the City of Milwaukee are Waukesha equipped. You can likewise have, in the highest-grade machinery, interchangeable engines and service parts, whether you use trucks, power shovels, pumping engines, pavers or fire engines, if you will select those with Waukesha "Ricardo Head" engines.

Write us about your problems, whether they are about new equipment or a replacement job. Our Sales and Engineering Departments will be pleased to assist you. Write for "Dymanic Thermostat" Book, telling about one patented Waukesha feature, and other Waukesha literature.

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A Boom-Type Backfiller for Fordson Mounting

Unit Has Normal Capacity of 40 to 75 Cubic Yards per Hour

IT is estimated that 80 per cent of all water, sewer, and gas ditches are being filled by team and scraper or by hand, on account of the high initial cost of the usual types of mechanical backfillers and the excessive cost of moving heavy slow-speed backfillers to and from the jobs. A light, high-speed backfiller recently developed by the Baker Steel and Machinery Company, Omaha, Nebr., is manufactured as an attachment for the Fordson tractor. It is equipped with a double-drum hoist, and is operated entirely by one man from the driver's seat of the tractor. The boom can be adjusted for lengths of 12 to 26 feet and can be instantly adjusted for vertical and horizontal angles. The bucket is constructed entirely of steel and can be adjusted to suit varying conditions.

In moving, the boom is collapsed and hung in a rack beside the head frame. The bucket is loaded on the luggage carrier provided and the

outfit can then be driven from job to job at 6 to 10 miles per hour. About one hour is required to first completely mount the outfit on the tractor. There are no changes made in the standard Fordson tractor in order to mount this backfiller. There are no holes to drill, as holes already in the tractor are used. The manufacturers supply longer bolts where necessary.

The manufacturers state that the backfiller does not interfere with the use of the tractor for normal purposes as the boom and bucket are quickly detached and the tractor can then be used for hauling, grading or any other purpose for which the tractor is ordinarily used. Since this backfiller is light, it may be used for small isolated jobs for which it would not ordinarily pay to move a heavy machine. The normal capacity of the machine is from 40 to 57 cubic yards of material per hour, depending on conditions and types of soil.



BAKER
BACKFILLER
IN USE ON A BIG
TRENCH

New Mundy Distributors

THE Mundy Sales Corporation, 30 Church Street, New York City, has announced the appointment of three new distributors for Mundy hoisting equipment. Barrett-Dunning, Inc., 143 East Ohio St., Indianapolis, Ind., has been signed up as exclusive distributor for the state of Indiana to handle the entire line of Mundy equipment. The Bacon Engineering Sales Com-

pany, 251 Erie Building, Cleveland, Ohio, has been appointed the exclusive distributor for the Mundy line of hoisting equipment including the new pattern three-speed hoist for northeastern Ohio. The Toledo Sales & Engine Company, 16 North St. Clair Street, Toledo, Ohio, has been made exclusive distributor for northwestern Ohio of the complete line of Mundy hoisting equipment.

Get after the holes bumps and hollows

FORTIFY your roads now.

Strenthen the weak spots before winter sets in—with the new, improved "Tarvia-KP."

Only twelve gallons of this new "Tarvia-KP" are needed to a cubic yard of stone to make a perfect patching mixture.

Greatly increased binding strength is the answer, of course—developed after many months of careful research and testing.

Try this new 12-to-1 "Tarvia-KP" mixture. You'll find that it gives you worthwhile savings in cost of materials—and a better job.

A post-card will bring you a practical booklet on "Tarvia-KP." Kindly address our nearest branch.

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THE BARRETT COMPANY, Limited

Tarvia-KP
FOR COLD PATCHING

A New Line of Rollers and Graders

Well-Known Line of Road Equipment Now Being Built Around Moderate-Size Industrial Tractor

A NEW line of rollers and graders made by the Galion Iron Works & Manufacturing Company, Galion, Ohio, built about the McCormick-Deering industrial tractor, has just been announced. This line includes three distinct machines, the Galion International roller, the Galion International E-Z Lift grader with rear drive, and the Galion International Standard grader with center drive.

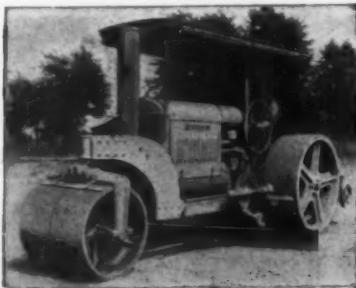
The roller is made in 5-, 6-, 7- and 8-ton sizes. The gearing from the tractor axle to the rear roll increases the power of the tractor from 50 to 60 per cent. As regular equipment, these rollers have a nine-tooth scarifier for use on waterbound macadam, gravel, cinder, or hard earth roads and street surfaces. A fully adjustable planer placed under the roller is also a part of the regular equipment. This planer is effective in smoothing and grading streets and road surfaces, subgrades, and on similar work. The roller can then be used to make the surface firm and smooth.



THE NEW INTERNATIONAL GALION E-Z LIFT MOTOR GRADER

cleaning ditches. It is of the rear-platform-drive type and can be equipped with cab and curtains if desired. The blade and moldboard may be 8, 10, 12, or 14 feet in length as desired. Dual rubber-tired rear wheels, Galion rollers on the rear, or the new Galion crawlers, may be secured as preferred. Roller wheels permit the rolling down of the road as it is being smoothed, while the crawlers give extra traction for heavier work such as cleaning ditches and grading. This grader has a scarifier which is independent of the blades in operation and which is controlled from the rear platform. This grader has the Galion E-Z lift springs and machine-cut worm-lift gearing operating in a bath of oil in the bottom of an oil-tight gear case. Forty-inch lift-wheels add to the ease of operation.

The Galion International Standard motor roller is similar to the E-Z lift in nearly every way except that it has open-lift gearing and the operator's position is near the central part of the machine, where he occupies a comfortable seat, or a spring-mounted platform if he prefers to stand.



THE INTERNATIONAL GALION ROAD ROLLER

The Galion International E-Z Lift motor grader is particularly designed for smoothing roads and

A Concrete Designers' Manual

THE second edition of the *Concrete Designers' Manual with Tables and Diagrams for the Design of Reinforced Concrete Structures*, by George A. Hool, Consulting Engineer and Professor of Structural Engineering, University of Wisconsin, and Charles S. Whitney, Structural Engineer, has just been published by the McGraw-Hill Book Company, Inc., New York, price \$4.00. The tables and diagrams presented in this manual make possible the rapid designing of reinforced concrete structures in accordance with the Joint Committee Recommendations, the American Concrete Institute Recommendations, the New York Building Code Requirements, and the Chicago

Building Code Requirements. This second edition has been entirely revised and a large amount of new material added to adapt it to the latest practice. The standardization of sizes of reinforcing bars and the elimination of unnecessary sizes have permitted an extensive condensation of the material published in the first edition. New tables and diagrams have been added on solid slabs, ribbed slabs, rectangular beams, doubly reinforced beams, T-beams, column footings, retaining walls and continuous beams. The sections on flat slabs, shear reinforcement and symmetrical arches are new. A wider range of unit stresses has been covered because of the general use of higher values.



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Steel Elevator Towers for Construction Work

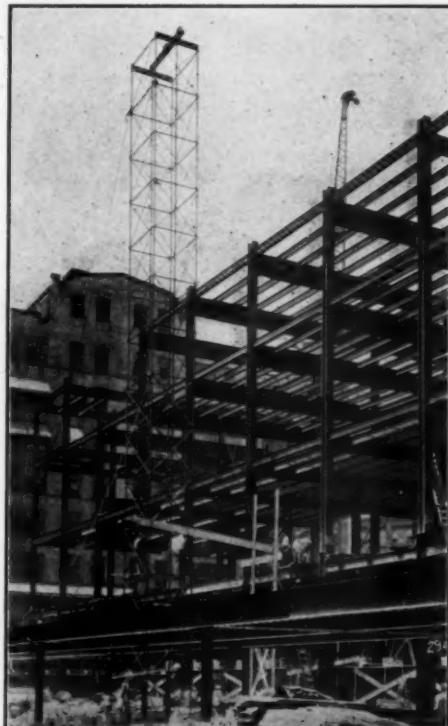
Study of Comparative Costs Shows Great Advantage for Steel Towers

A STEEL elevator tower, as compared with a wooden tower, is superior in strength, speed of erection, and safety, and involves less supervision in erection, less wind resistance, less fire hazard, and lower cost. Since safety is an essential on every construction project, great thought must be given to this factor. The American Tubular Elevator Co., 4700 Second Ave., Pittsburgh, Pa., states that there has never been an accident with an American tubular elevator.

All leg sections, girths, braces, and guys of the American tubular elevator are interchangeable, making it impossible to put any part in the wrong place and making the erection a quick and simple operation which can be performed by unskilled labor as easily as by skilled. The character of the joints and connections, as well as of the weights of the several parts used in the construction of this elevator, is such that one man can easily handle them. Elaborate gin poles and tackles for erection are said to be unnecessary. The dismantling of the elevator usually takes from one-third to one-half the time of erection, and when it is down it is ready to go on the next job and do its work all over again.

As will be noted from the illustration, the elevator is sturdy in construction. The tubular section provides an economical distribution of metal for use as a column. The girths and braces offer a stiffness which not only prevents rattling and vibration, but also minimizes the bending of parts when stored and not in use. The landing panel consists of one horizontal girth and two diagonal braces, or two horizontals and two diagonals, according to choice, designed to accommodate landings at floor levels using landing panel clamps where sleeve bolts are not available.

The cathead is made up of 6-inch channels with spacers and $\frac{3}{8}$ -inch tie bolts, shipped and erected assembled, weighing about 330 pounds. The cathead bearings are equipped with automatic grease-cups. The cathead may be placed in any position, square or diagonally across the top of the tower. The base is made of sturdy I-beams, to insure strength and correct alignment. Guide holes are punched in all of the sills to allow interchangeability. The cage is built with a wooden platform,



AN AMERICAN TUBULAR STEEL ELEVATOR USED IN THE CONSTRUCTION OF THE PITTSBURGH PRESS BUILDING, PITTSBURGH, PA.
Photograph by courtesy of Dravo Equipment Company, Pittsburgh, Pa.

the guide-shoes, which are easily and cheaply replaced, being the only parts subject to wear. The cage comes in two sizes, one 5 feet 5 inches by 5 feet 8 inches, capable of taking care of two wheelbarrows or one concrete buggy, and the other 7 feet $\frac{1}{4}$ inches by 5 feet 8 inches, capable of taking three wheelbarrows or two concrete buggies. The Dravo Equipment Company of Pittsburgh, Pa., are general distributors of these towers.

Talbot Made Manager of Cement Sales

THE Cowham Engineering Company, 111 West Monroe Street, Chicago, Ill., has announced the appointment of K. H. Talbot as Manager of Cement Sales. This company designs, builds and operates portland cement plants. It acts as manager and operator for the three plants of the Consolidated Cement Corporation at Cement City, Mich., Fredonia, Kans., and Mildred, Kans. It is

now constructing for the Florida Portland Cement Company a 1,500,000-barrel plant at Tampa, and has recently announced the construction of a plant at Portland, Maine, to begin in the near future.

Mr. Talbot was formerly with the Centrifix Corporation of Cleveland, and also with the Kochring Company, Milwaukee, and the Universal Portland Cement Co., at Pittsburgh and Chicago.



Why Bear Cat Owners are Boosters



J. E. & G. W. BRYAN, of Portsmouth, Va., use their Bear Cat with clamshell bucket for digging wet sewers.

"I think it is the best kind of machine for my particular work," writes G. W. The features that appeal to him the most, he says, are "the amount of hard surface it takes off—then it can be turned around in small space—is great for unloading materials."

Wm. B. Smith, of Cleveland, Ohio, uses his Bear Cat with clamshell bucket for backfilling, loading surplus, lowering large water pipe, etc.

"Never found it to fail to do all we want of it," he wrote, after using the Bear Cat 18 months. Both of these owners estimate their total operating cost at \$18 per day.

When hundreds of Bear Cat owners are getting results like these it's time for you to do some investigating of the Bear Cat yourself. Speed, low cost, one-man operation, full crawler traction, all around usefulness, dependability—that's the Bear Cat.

Wire, 'phone or send coupon for full information.

THE BYERS MACHINE COMPANY, Ravenna, O.

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10-36

A New Two-Ton Truck for the Construction Industry

New Chassis Available with Variety of Bodies for Practically Every Requirement

THE latest additions to the line of trucks made by Graham Brothers, Detroit, Mich., are new models of two-ton capacity. Only two lengths are being made; the shorter, for 9-foot bodies, has a wheelbase of 137 inches, and the longer, which is for 12-foot bodies, has a wheelbase of 162 inches. Both chassis are equipped only with pneumatic tires with the option of either single or dual rears. Where single tires are used, 32 x 6-inch size are fitted in front and 34 x 7-inch at the rear. For dual rear tire equipment, disc wheels are standard with 34- x 5-inch tires both front and rear.

The pressed-steel frame side-rails for the shorter chassis are 7 inches deep and for the longer 7½ inches. Because of the lower bending moments in the short frame its thickness is 3/16-inch, while that of the longer frame is ¼-inch. Front springs on both chassis are 37 inches long, 2 inches wide, and have 9 leaves, while the rear springs are 56 inches long, 3 inches wide, and have 11 leaves. The semi-floating rear axles employ a spiral bevel-gear final drive with a reduction of 6.286 to 1.



GRAHAM BROTHERS' NEW TWO-TON TRUCK

Both service- and hand-brakes are of the internal self-aligning type operating in heavy pressed-steel drums at the rear hub. The brakes are so connected that the pedal operates all four bands, while the hand-brake lever actuates only two.

The power unit is a Dodge Brothers 4-cylinder engine as is used on all Graham trucks and motor coaches, with a heavy-duty truck type transmission. The stronger frame, springs, and other chassis parts are made to insure satisfactory service with two-ton loads.

Measuring Device for Water for 27-E Paver

Manufacturer Claims Device for Accurate Timing and Measurement Results in Increased Strength of Concrete

THE water-supply system developed by the Koehring Company, Milwaukee, Wis., for use on its 27-E paver is claimed to deliver the correct amount of water to the mixing drum in the shortest interval of time demanded by practical operation. Tests and experiments have conclusively shown that the correct timing of the admission of water into the mixer drum, and accurate measurement of that amount, definitely increase the strength of the resultant concrete.

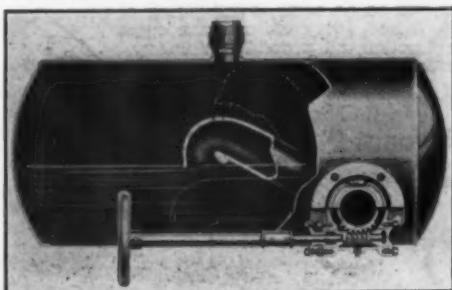
The charging skip of the Koehring 27-E paver at the right instant automatically opens the balanced three-way valve, starting the discharge of water. The rising skip trips a lever on the valve which is carried over the center and positively

to the end of its stroke by a spring and at that instant allows the water to enter the mixing drum just before the material enters. The water therefore goes all around the blades and buckets, washing away the accumulation of the previous batch and assuring a clean drum. The water flows until all the aggregate is in the drum, assuring that the aggregate will be wet as soon as it has entered the drum.

The automatic opening of the water valve not merely saves one operation for the operator, but by being correctly timed with the other operations of charging gets all the materials into the drum in minimum time.

Accuracy of measurement and clean, non-dripping discharge is accomplished by specially designed component parts of the entire water-supply system. The regulating valve determines the amount of water supplied to each batch of aggregate. The peculiarly shaped hooded intake on the measuring pipe inside of the tank uses the siphon gravity principle originally brought out by the Koehring Company in 1921. The adjustment of this measuring pipe for various quantities of water is controlled by a hand-wheel-operated worm and gear. The hand-wheel is easily accessible to the mixer operator and the gearing is self-locking in any position.

A place for a padlock is provided so that the valve, when set for a certain quantity of water,



SECTIONAL VIEW OF THE NEW KOEHRING WATER TANK

A Full Revolving Back-Filler

Buckeye ✓ **NEW** in big performance and general utility

Buckeye saw the need for a Back-Filler with greater performance ability than ever before conceived—and filled it with this new Utility Back-Filler.

The entire platform turns in a full circle. No "jockeying" to get in position. Swings into line in a fraction of a second. The boom has a quick adjustment from 29- to 33-ft. lengths—a short range adjustment from 21 to 25 ft. Such variation in reach meets every possible condition.

The travel is on full-length Alligator Traction. Over soft mud without slipping; over paved streets without damage to their surface.

The power plant is the kind that has plenty of capacity—a heavy-duty gasoline unit of the finest design and manufacture. The entire construction is the kind that Buckeye has always been famed for—All operations are power actuated and

controlled by the operator by levers banked within easy reach. The toughest steel, and plenty of it where it's needed—

Machine-cut gears and precise assembly that guarantees long service.

From this bare description you can easily appreciate that the new Utility Back-Filler will outperform the ordinary back-filler any day and every day.

Add the usefulness of this machine as a dragline or light crane, and you will see why contractors who have viewed the Utility Back-Filler say it's the greatest development of the year. As a crane, it may be equipped with a clamshell for handling and digging.

Ask for illustrative and descriptive bulletin.

THE BUCKEYE TRACTION DITCHER COMPANY Findlay, Ohio

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screening Machines, Curb Diggers and Clay Diggers.

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BUILDERS OF TRENCH EXCAVATORS FOR OVER 50 YEARS

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can be locked. If the regulating valve is moved, the open end of the measuring pipe will be on an arc described along the center of the tank. This assures the least possible deviation from accurate measurement when the mixer is working on a grade or superelevated curve.

The measuring tank is automatically filled when the balanced three-way valve is in filling position. The water from the top of the tank down to and no further than the opening in the end of the regulating pipe can run into the mixing drum when the balanced valve is tripped. The design of the mouth on the regulating pipe is such that all flow of water to the mixing drum will positively and immediately stop just at the instant when the water level in the measuring tank reaches the opening of the measuring pipe and

air which has entered the measuring tank through the check valve breaks the siphon, so that there can be no dribble.

The siphon is self-priming, positive, and automatic. The measuring tank is tested to 150 pounds hydrostatic working pressure. It is provided with a check valve which opens as soon as the balanced three-way valve is tripped, admitting air to the measuring tank, so that there is a full, steady flow of water to the mixing drum, and the valve does not close until the tank is again filled with water for the next batch.

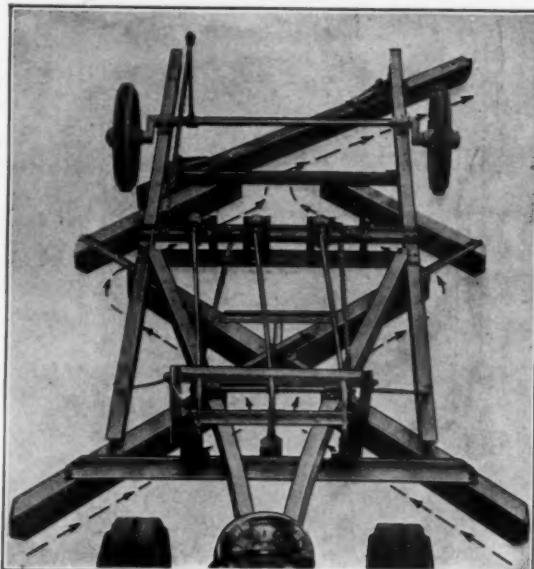
Straight flow from the tank to the drum secures a fast, clean discharge of water. The diameter of the discharge pipe is 3½ inches. The discharge pipe in the mixing drum is a casting and is securely fastened so that it cannot move.

A New Road Maintainer with Unique Features

One-Man Machine Works Material Across Road Four Times in One Trip

THE new Adams one-man road maintainer No. 6, manufactured by J. D. Adams & Company, Indianapolis, Ind., is so designed that it can be hitched to any light tractor by a simple drawbar and clevis, thus leaving the tractor readily available for other work, and the maintainer need not be held up for any possible tractor repairs. The maintainer has 40 feet of blade, which works the road surface four times, thus doing four times the work of a motor grader or a single-blade machine. The blades are rigidly fastened to the main structure and cut in the same plane. The machine itself rises and lowers with the blades. Maintainer controls are conveniently placed so that one man in his normal position on the tractor can easily control both machines.

The Adams one-man maintainer cuts 9 feet wide. The illustration shows the manner in which the loose material cut by the blades is worked back and forth across this 9 feet four times in one passage. The operator sets the blades to cut the proper depth and pressure according to road conditions. Adjustments are easily made without stopping.



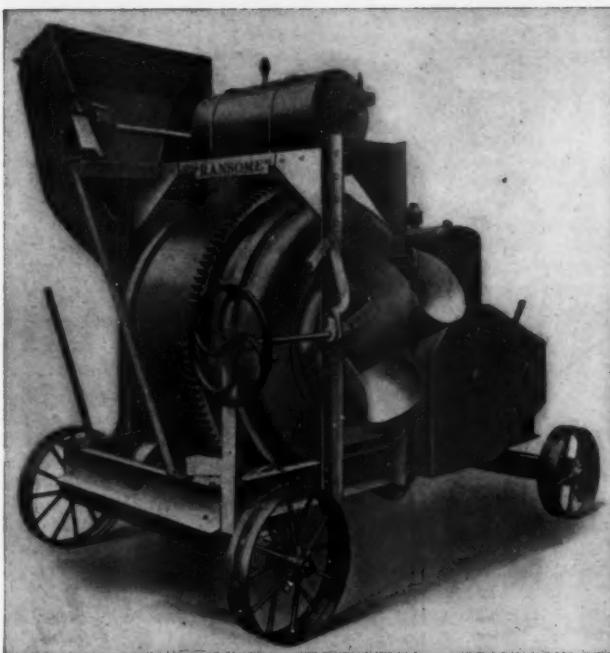
THE NEW ADAMS MAINTAINER, SHOWING PATH OF EARTH

Summary of Accidents in Steel Erection

THE following segregation of 100 accidents in steel erection may serve as a warning:

1. Falling objects	40	4.	Handling by hand	4
6 ironworkers themselves struck by falling rivets, bolts, and needle beams		5.	Ironworkers falling from beams, floors and scaffolding	6
34 in other trades, such as masons, fireproofers, carpenters, electricians, wire lathers, painters, elevator constructors. Of the 34 injured, five were struck by hot objects		6.	Ironworkers slipping on beams and floors	6
2. Ironworkers injured by throwing of hot objects, struck or burnt by rivets or scale from rivets	10	7.	Ironworkers struck by mauls of fellow workmen	4
3. Handling iron by derrick, such as hoisting from the street, storing and erecting	17	8.	Ironworkers handling defective equipment, plungers, snaps and air hammers	4
		9.	Ironworkers—nail punctures	2
		10.	Ironworkers struck by derrick or load	3
			Total	97
			Miscellaneous	3
			Grand total	100

here's a 10-S that is a 10-S Mixer!



**10-S Standard
Building Mixer
on trucks, with
Power Loader
and Automatic
Water Tank.**

Look at that drum—39 inches long by 51 inches in diameter, inside measurements. There's real 10-S capacity for you. And it's a steel drum, too, with flanged heads, electrically welded. Timken bearings on the Drum Rollers, too.

And get the idea of that Control—one set of levers at the drum end of the mixer gives the operator complete control and does away with all need for levers on both sides of the machine. It's certainly one real 10-S mixer.

Made with steel or rubber-tired wheels; low charging chute or with power loader and automatic water tank; 4 cyl., 15 H. P., vertical radiator cooled LeRoy gasoline engine or either AC or DC electric motor.

If you're thinking of buying a 10-S Standard Building Mixer, look this over. It has the stuff in it. Write for copy of Bulletin.

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212

Ransome Standard Building Mixers.

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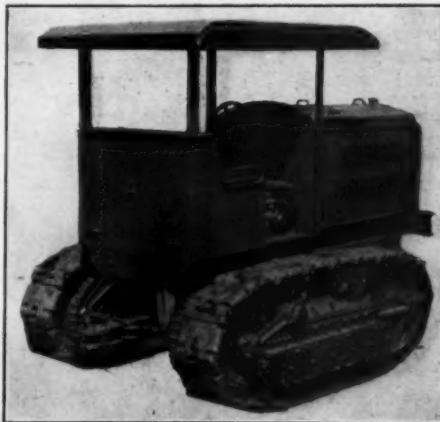
A New Five-Ton Tractor

Simplicity, Compactness and Low Center of Gravity Are Featured

THE new 5-ton Monarch Model-G tractor made by the Monarch Tractors Corporation, Springfield, Ill., has a draw-bar capacity of fully 20 horsepower; its full five tons weight enables this power to be effectively employed; the truck members have the proper oscillation and flexibility to provide adequate traction in the widest variety of field conditions; it is of compact construction and has a low center of gravity to permit working in narrow quarters and on steep grades; it is of simple design, easily lubricated, and has full protection against the entrance of dust and dirt; it is steered readily, and has rugged durability. These are the features mentioned by the manufacturers in placing this new model on the market.

The general dimensions of this Monarch tractor are: length, 10 feet over all; width, 6 feet 2 inches over all; height, without top, 5 feet 6 inches; length of ground contact, 5 feet 6 inches; ground clearance, 1 foot 3 inches. It has three speeds forward and one reverse, forward speeds being 1.75, 2.34 and 3.75 miles per hour and the reverse 1.5 miles per hour. Steering is accomplished through friction brake-drums located at the ends of the differential shaft at each side. By means of the steering wheel convenient to the operator's seat, contracting bands $3\frac{1}{2}$ inches wide operate on the brake-drums, which measure 16 inches in diameter.

Each track comprises 20 links or shoes, each 12 inches wide. On the inner or upper side of the shoe, two low rails are cast integral and the truck wheels roll smoothly along the rails. The inner edge of the rail is rounded so as to give a smooth rolling action to the truck wheels. Near each end of the inner or upper surface of the



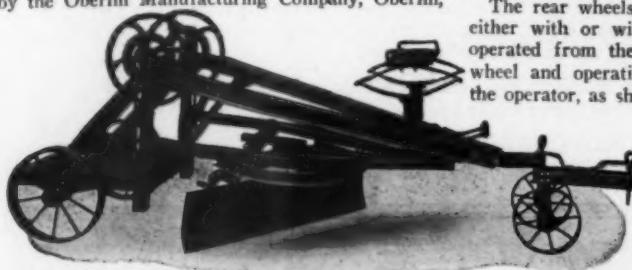
THE NEW MONARCH 5-TON TRACTOR

shoe are cast two lugs of special design forming a driving contact with the staggered teeth of the driving sprocket. As the track is carried forward one section at a time the teeth in the front sprocket engage with the lugs on the track shoes. With the tracks thus firmly held, the truck wheels stay on the rails under all conditions. The shoe has a smooth ground contact. Detachable grousers may be fitted for extreme conditions in mud, snow, or ice.

The tractor is equipped with a roadmaker's top designed for the attachment of full glass winter enclosure or curtains, as desired.

A Grader and Scarifier for Team or Tractor Operation *An Effective Unit for Highway Contractors' Service*

THE Ohio Leader, a team- or tractor-drawn grader which also carries a scarifying unit, is built sufficiently strong for rugged work by the Oberlin Manufacturing Company, Oberlin,



THE LEADER
ROAD GRADER
WITHOUT
SCARIFIER

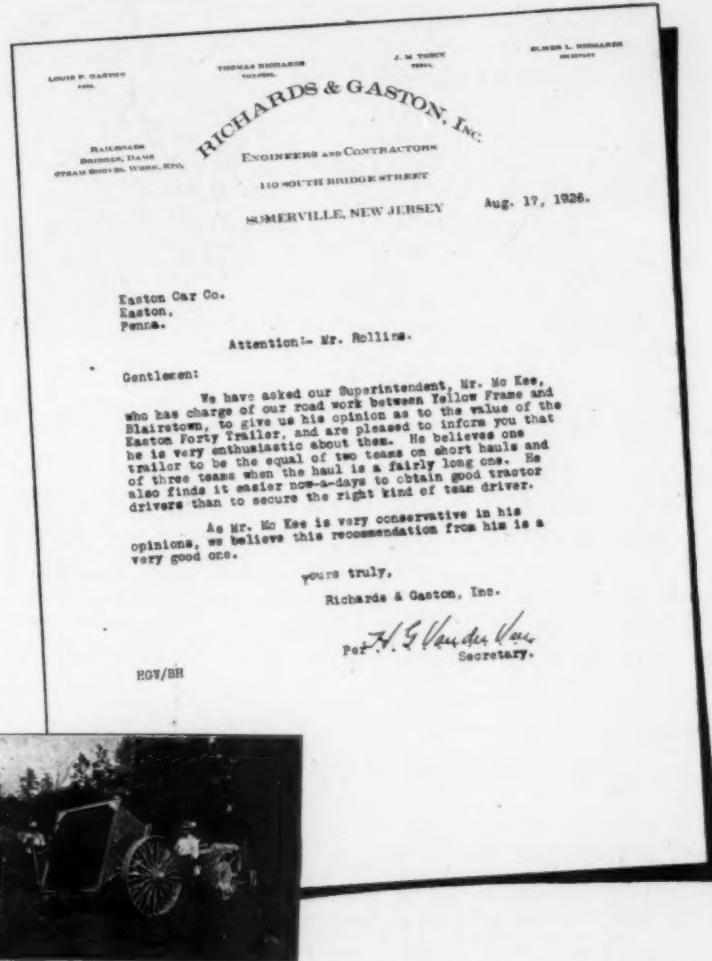
Ohio. The scarifier can be used in conjunction with the blade if desired. The blade is equipped with fenders, making it a very effective unit for leveling material or subgrading. The vertical

adjustment of the blade is taken care of by a latch wheel and chain hoist mechanism, and the lateral adjustment is by a pin slide feature.

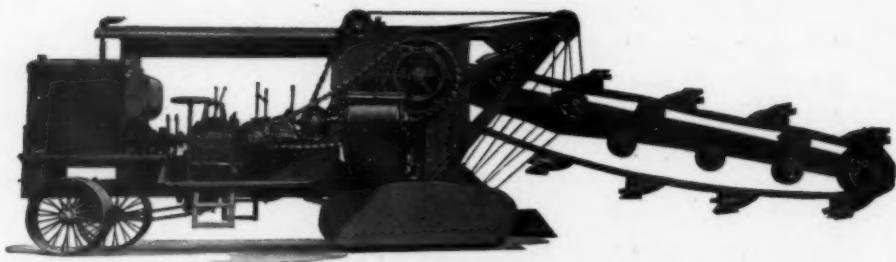
The rear wheels of the Ohio Leader are made either with or without flanges. The machine is operated from the rear platform, with the hand wheel and operating mechanism within reach of the operator, as shown in the illustration. One of

the distinct advantages of the machine is that it can be turned within the forms on a concrete road, making it excellent for handling the final subgrade work on a concrete road job.

Construction Superintendents don't talk like this unless they mean it. We would like to tell you of the experiences other Road Contractors are having with Easton "Forty" Trailers.



EASTON CAR & CONSTRUCTION CO.
Offices and Works
KANSAS CITY, MO. **EASTON, PA.**



THE NEW P & H LADDER-TYPE TRENCHER

A New Ladder-Type Trencher

Machine Is Product of Fourteen Years' Development

TWO new models of ladder-type trenchers known as Model 10-30 and Model 15-36 have been developed by the Harnischfeger Corporation, Milwaukee, Wis. The first is built to cut trenches up to 13 feet deep and from 22 to 35 inches wide, and the second to cut trenches up to 15 feet deep and from 22 to 42 inches wide. Both machines embody the same principles of design and construction.

All the main machinery in these models is mounted in one cast-steel case, fully enclosed. All drive-gears have double cut teeth, and every motion has three speeds forward and one reverse with no changing of sprockets. The levers are arranged for control from either side of the machine. Full protection is provided for all parts of the machine as well as for the operator.

The motor to operate the machine is of the four-cylinder heavy-duty type and is equipped with an air cleaner and an impulse-coupled magneto and has pressure feed lubrication to all main and connecting rod bearings. The main connection to the motor is made through a balanced Twin Disc clutch which is fully enclosed.

The digging boom is made in a box section of channels top and bottom with plates riveted on the sides. It is adjustable to various depths of trench, the extension joints overlocking so that strength is assured at this point. The boom is hinged directly over the rear axle, throwing its weight on the large bearing area of the corduroy tread and preventing the necessity of counter-

weight on the front of the machine. The bucket chain is made up of heat-treated electric steel links. These are reversible and easily removed. They are made with a dovetail-wedge pin joint which holds the links securely, but which can be taken out or replaced easily.

The buckets are shaped of pressed steel and are extra heavy with a reinforced tool-steel lip. Connection with the digging chain is made by small ears of alloy steel which may be replaced when worn without replacing the whole bucket. The bucket cleaner is hinged on the excavator shaft and is arranged so as to scrape off all sticky mud or clay. It is held in position by a compression spring which will allow a stone or chunk of wood to pass through without breakage.

The boom position is under the control of the operator at all times, so that he can dig accurately to grade regardless of soil conditions and ground contour. The boom hoist is driven through a self-locking worm-gear controlled by friction clutches which prevent any drifting or dropping of the boom. The actual hoisting or crowding is accomplished by a set of cables driven from grooved drums at the top of the crane held by wedge blocks. The hoisting cable is in one piece, reeved so that the pull is equalized for both sides of the boom. The crowd is positive in operation in that it is operated automatically in conjunction with the hoist. The tension of these cables is maintained by screws and heavy coil springs located near the corduroy axle.

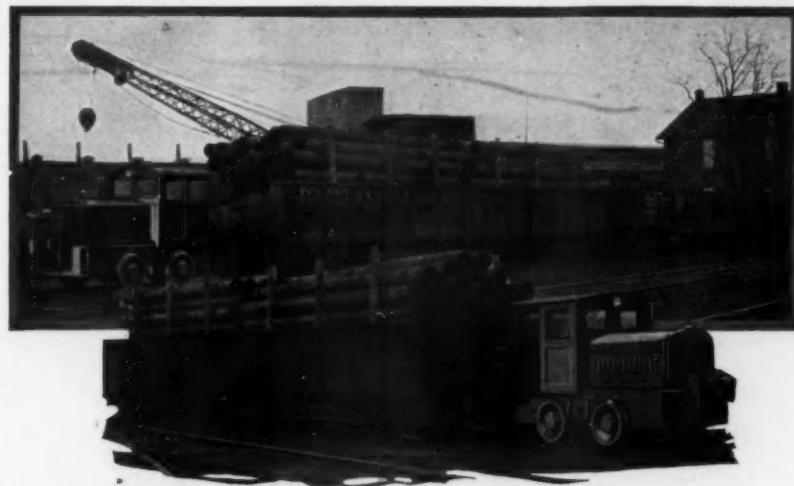
McMyler-Interstate to Begin Structural Steel Fabrication

THE McMyler-Interstate Company, Cleveland, Ohio, has announced that it will immediately re-enter the structural steel fabricating field, coming into the market with plant facilities for producing from 800 to 1,000 tons per month. At the Bedford, O., plant of this company, more than 30,000 square feet of floor space will be exclusively devoted to the fabrication of structural steel. Under the present arrangement it is planned to have the department assigned to this work devote

its entire attention to structural steel fabrication. The firm will not enter the erection business.

Hayman Becomes Los Angeles Full-Crawler Distributor

THE Full-Crawler Company, 500 Clinton Street, Milwaukee, Wis., has announced the appointment of the B. Hayman Company, Inc., 148 North Los Angeles Street, Los Angeles, Calif., as distributor for Trackson Full-Crawlers for Fordsons in the territory previously covered by the O. R. Peterson Company, Los Angeles.



Faster Haulage—Lower Costs

Whitcomb Locomotives with their more than ample horse power per ton, assure rapid haulage at low cost.

Instances of haulage at less than $\frac{1}{2}$ cent per ton are not uncommon and when you consider the fact that maintenance is a negligible item and that a licensed operating crew is not necessary, it is easy to see how "Whitcombs" will fit into your haulage program.

For contract haulage, or switching cars at storage points, "Whitcombs" are ideal. They are made in all sizes and gauges and may be had powered by either gasoline engines, electric storage batteries, or fitted with a trolley.

Our Engineering Department is thoroughly conversant with all types of haulage problems and will be glad to help you select the proper type of locomotive for your work.

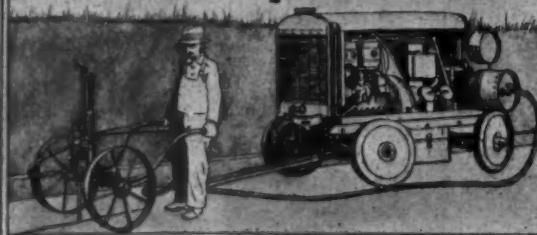
GEO. D. WHITCOMB COMPANY
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Helpful Material



CONCRETE CARTS READY FOR DELIVERY

When a contractor needs concrete carts he does not want to wait. The order goes to the house that can deliver. Akron concrete carts with underslung steel heat-treated axles, removable bushings and grease cups, 12-gage hoppers and the right balance for easy handling, are described in the new catalog and price list of the Akron Barrow Co., 3140 East 65th St., Cleveland, Ohio.

ARE YOU STILL USING TEAMS FOR DIRT MOVING?

The Miami Trailer-Scraper Co., 610 S. Clay St., Troy, Ohio, has recently issued a folder which shows that the Miami one-man power scraper positively makes teams an expense, as it can move more earth per day than other equipment and save from \$10 to \$15 daily over team-scraper work.

DIRT HANDLING BY ONE MAN

Loading, moving, dumping, or spreading the earth, no matter what the operation, all is controlled from the driver's seat when a Schaefer automatic scraper is attached to your tractor. The Contractors Circular, issued by the Gustav Schaefer Wagon Co., 4180 Lorain Ave., Cleveland, Ohio, tells the whole story. A copy is yours for the asking.

A PLOW THAT REALLY ROOTS

Wiard plow No. 69 grips its way through the toughest pavements and roads like a mighty, powerful giant. The Wiard Two-in-One plow saves the cost of extra equipment, converting a rotoer into a share plow economically and quickly. Complete details may be secured from the Wiard Plow Co., Batavia, N. Y.

CALCIUM CHLORIDE CUTS THE CURING PERIOD FOR CONCRETE

It is no longer necessary to wait 28 days to open up concrete roads. By using Solvay flake calcium chloride the curing period can be cut to 7 days or less. If you desire some really helpful knowledge on this subject, you will find it in the literature of the Solvay Process Co., Wing & Evans, Inc., Sales Dept., 40 Rector St., New York.

AUTOMATIC BOTTOM-DUMP BUCKETS THAT DO NOT KICK

The Unionloc automatic dump-buckets, made under the Lockwood patent by the Union Iron Works, Inc., Hoboken, N. J., and which are hingeless, with self-adjusting doors and do not kick when dumped, are described completely in literature which may be secured from the manufacturer.

CENTRIFUGAL PUMPS FOR SEWAGE OR GRITTY WATER

Bulletin D-2, issued by the Lawrence Pump & Engine Co., P. O. Box 70, Lawrence, Mass., describes Lawrence Vortex centrifugal pumps specially designed for pumping sewage or any liquid carrying more or less solid material, or for use by contractors in all types of construction work.

TRUCKS FOR THE ROAD BUILDER

Graham Bros., Detroit, Mich., has issued a book of facts for the guidance of road builders and contractors in the selection of motor trucks which not only describes various types of bodies for service of this kind, but contains very helpful articles on wider streets and highways, railroad-crossing elimination, economy of motor truck operation and other valuable data.

A MORTAR MIXER THAT MIXES

The Tal-Flo mixer which will mix all kinds of coloring mortar successfully in one-quarter the time of other machines and which has a number of special features that make all the work more effective and easier, is described in the literature of the Talbot-Flood Manufacturing Co., Inc., 521-22 Dwight Bldg., Kansas City, Mo.

The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up to date on the subject of machinery and equipment.

AN EXCAVATOR THAT CUTS THE COST OF DIGGING

A live boom, a powerful cable crowd, a single-lever dump control, and a special crawler, feature the Mead-Morrison crawler excavator, described in Bulletin No. 131 which may be secured from the Mead-Morrison Mfg. Co., 748 Prescott St., Boston, Mass.

AN EASILY-OPERATED, LARGE-CAPACITY SCRAPER

The Euclid scraper, which moves more earth, reduces labor cost, saves time and money, and is easy to operate, is described in a folder issued by the Euclid Crane & Hoist Co., 108 Chardon Road, Euclid, Ohio.

A TRAILER THAT REPLACES THREE TWO-HORSE TEAMS

The Easton trailer, which takes the place of three two-horse teams and which is self-dumping and self-righting, is described in the literature of the Easton Car & Construction Co., Easton, Pa.

HANDY HOISTING AND HAULING

This is the title of a new booklet, No. 132, made up chiefly of illustrations showing the Sullivan Turbinair hoist used by contractors in various ways. If you wish a copy of this booklet, write direct to the Sullivan Machinery Co., 162 South Michigan Ave., Chicago, Ill.

A BULLETIN ON HALF-YARD SHOVELS, CRANES AND DRAGLINES

The Speeder Machinery Corp., Sheffield, Iowa, has issued in its Bulletin J-26 a great deal of helpful information on excavation including a complete description and illustrations of the Model B-1 half-yard shovel, crane, and dragline.

ROAD-GRADING AND DRAGGING MACHINES

The Ohio Leader, a one-man grader with scarifier attachment, the Little Yankee, a reversible grader of special design for subgrade and surface leveling work, also with scarifier, and the Ohio two-blade road drag with a strong, rigid steel frame, made in 7- and 8-foot lengths, are described in the latest literature of the Oberlin Mfg. Co., Oberlin, Ohio.

HIGH-CAPACITY AIR-COMPRESSOR AT REASONABLE COST

O. K. portable air-compressors of 118, 160 and 265 cubic ft. piston displacements, with various mountings, are described in the literature of the O. K. Clutch & Machinery Co., Columbus, Ohio, which also makes gasoline and electric hoists.

A STORAGE BIN FOR ROAD PAVERS

A bin which is simple in design and with unit construction that makes it possible to erect the bin and have it ready for use in a few hours, with sides, partitions and bottom of 2-inch dressed flooring with interlocking joints, dispensing with nails, bolts and spikes, and with batcher gates easily operated from the ground, is described in a folder issued by the James B. Seavers Co., 1315 South Oakley Ave., Chicago, Ill.

WHEELBARROWS BUILT FOR WORK

Better wheelbarrows which mean more and better work and which have specially shaped handles, making it possible for a man to handle the barrow faster and with less effort, and which are equipped with a "Never Break" wheel, are described in the Bull Frog barrow literature issued by the Toledo Wheelbarrow Co., Toledo, Ohio.

EXCAVATORS WITH SHOVEL ATTACHMENT

Working in sand or gravel banks, handling materials from stock piles to truck, working in a borrow pit, or grading a street or road, are just the jobs for an Inslay shovel, which is capable of handling 200 to 450 cubic yards a day. Catalog No. 40, issued by the Inslay Manufacturing Co., Indianapolis, Ind., describes this excavator completely.

PERRY SCRAPERS



Time, Labor and Money Savers

**Fills, Hauls and Dumps
with Tractor in Continuous Forward Motion—
No Stopping or Backing!**

This is a one man tractor scraper that is really efficient, mechanically simple, practical, and durable. By means of a conveniently located lever the tractor driver easily controls every movement of the scraper. In filling he can vary the depth of cut as desired; making a deep cut or a shallow cut. In unloading he can dump in a heap or spread to grade. And the whole process is accomplished with the Tractor in continuous forward motion. NO STOPPING OR BACKING.

With this outfit grading and earth moving work can be done at lower cost per cubic yard than has heretofore been possible, and lower costs mean bigger profits to the contractor.

For more information, write to

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STATIONARY BIN

The Heltzel "One-Man" Measuring Batchers
 referred to by Albert R. Haeney, City Engineer, Struthers, Ohio, as "the most valuable piece of equipment ever used in connection with a Heltzel TRAILER BIN" outfit owned by Grady & Turner, Youngstown, Ohio, contractors, in work at Struthers, Ohio, which covered several months. Mr. Haeney added that "The accuracy of the measuring device cannot be surpassed."

HETZEL "ONE MAN" BATCHERS are without any exception the speediest and most efficient built today. One man by operating a single lever, performs the complete operation of filling, cutting off, dumping the batch of sand and stone, closing the lower and opening the upper gates in less than 10 seconds. Write today for catalog of HETZEL BATCHERS, TRAILER BATCHER BINS, SECTIONAL STEEL BINS and CAR UNLOADERS.

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REMOVING SURFACE IRREGULARITIES FROM CONCRETE

The Berg concrete surfer and finisher which is unequalled for removing fins, board or form marks, and all surface irregularities, from concrete, is described in detail in the literature of the Concrete Surfacing Machinery Co., 4669 Spring Grove Ave., Dept. F, Cincinnati, Ohio.

CONVEYORS THAT CUT MATERIAL-HANDLING COSTS

Burch conveyors that convey at a speed which insures profit by lessening the cost of material handling and thus help contractors to keep their trucks moving, are described in the literature which may be secured from the Burch Plow Works Co., Dept. MA, Crestline, Ohio.

STANDARD HOISTS AND DERRICKS FOR CONTRACTORS

Clyde steam, electric, gasoline and belt-driven hoists and derricks which are standard in many contracting operations, are described in a helpful illustrated catalog issued by the Clyde Iron Works Sales Co., Duluth, Minn.

SHOVELS, SPADES, SCOOPS AND SPECIALTIES

The American Manufacturing Co., Chattanooga, Tenn., in its No. D catalog and price list illustrates and describes its extensive line of shovels, spades, scoops, hardware, steel, and wire specialties.

MORE YARDS OF CONCRETE PER DAY

The Chain-Belt Co., Milwaukee, Wis., has issued in its Catalog 137 some very pertinent information regarding Rex 7-S and Rex 5-S mixers and other data built around the comment "We've an idea contractors are in business to make money."

TRACTORS FOR HIGHWAY BUILDING AND MAINTENANCE

Only the best equipment can be expected to stand up under the heavy tasks of highway building and maintenance. Tractors particularly are subjected to treatment that can be withstood only by a product that is right. Cletrac, the year-round tractor for road work, is described in the literature of the Cleveland Tractor Co., Cleveland, Ohio.

ROAD FORMS THAT HOLD THE GRADE

"The most uniform in grade and line I have ever supervised" is what one prominent city engineer says of Heitzel curb and gutter forms. Information regarding Heitzel curb, curb and gutter, and integral curb and base forms, will be found in a new bulletin just off the press and which may be secured from the Heitzel Steel Form & Iron Co., Warren, Ohio.

ROCK DRILLS THAT ARE JUST THE RIGHT SIZE

The "Jackhamer" which is a superior type of rotating hand-held rock drill made in just the right size for a long day's drilling, is described in Bulletin 446 issued by the Ingersoll-Rand Co., 11 Broadway, New York.

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The Waugh sign on a rock drill, drill steel sharpener, concrete breaker or clay digger, is the contractor's assurance of high speed, high efficiency and completely satisfactory performance. If you are interested, write for the literature of the Denver Rock Drill Mfg. Co., Denver, Colo.

DERRICKS AND WINCHES

The Dobbie Foundry & Machine Co., Niagara Falls, N. Y., will be pleased to send a copy of its complete catalog No. 22, describing the complete line of Dobbie derricks, winches and fittings.

BETTER ASPHALT STREET REPAIRS

A letter or postcard addressed to the Equitable Asphalt Maintenance Co., Kansas City, Mo., will bring you full and complete information regarding the Equitable surface heater which is operated with a gasoline engine, is designed for power at low speed, eliminates all dirt, water and steam, and makes it possible to resurface without flame from 1,500 to 2,000 square yards of pavement in an 8-hour day.

MATERIAL-HANDLING BUCKETS AND MEASURING BINS

The Erie 11-ton Aggre-Meter plant for loading compartment trucks or batch-boxes or for loading batches direct into the mixer hopper, furnished in all-steel or a combination of steel and wood, and the Erie one-yard "Peerless" bucket which has great closing power, long cable life and takes a big load at every grab, as well as the Erie Special digger bucket, are all described in the literature of the Erie Steel Construction Co., Erie, Pa., which may be secured on request.

PERMANENTLY MARKED TOOLS AND EQUIPMENT

The Everhot branding torch, which brands or solders continuously, permanently marks your tools and your equipment, making them safe from the hands of pilferers, is described in a circular that will be sent free by the Everhot Mfg. Co., Maywood, Ill.

OIL-BURNING KETTLES FOR ROADS AND BOOFS

Connery's oil-burning kettle, Style J, is recommended by the manufacturers, Connery & Co., Inc., 4,000 North Second St., Philadelphia, Pa., for highway maintenance work and for the roofing contractor. Low fuel cost and absolute temperature control are assured by the construction of the inside tank which keeps the hot and cold materials separate. Write for the circular describing this kettle.

A NEW COLD-PATCHING MATERIAL

The new improved Tarvia K-P is the same dependable material plus vastly increased binding strength and may be used in proportions of 12 gallons to each cubic yard of aggregate for patching. A postcard addressed to the Barrett Co., 40 Rector St., New York, will bring you a practical booklet on "Tarvia K-P."

RELIABLE HOISTING BLOCKS

Information regarding Star Brand hoisting blocks made by the Boston & Lockport Block Co., East Boston, Mass., and which are always reliable and made for every condition of service, may be secured from this company.

PORTABLE AIR-COMPRESSORS FOR EVERY DEMAND

Buhl air-compressors, which are made by the Buhl Co., 405 S. Dearborn St., Chicago, Ill., in a variety of sizes and types to meet every portable compressor demand, are described in bulletins which may be secured by interested contractors on writing to the Buhl Company.

A BOOK ON THE USE OF EXPANSION JOINTS

Complete data on the use of expansion joints are contained in an interesting 52-page book which may be secured without obligation from the Philip Carey Co., Lockland, Cincinnati, Ohio, manufacturers of Carey Elastite expansion joints, which consists of a heavy body of fibrous asphaltic compound sandwiched between two layers of asphalt-saturated felt.

A GASOLINE CRANE WITH MULTI-PLANE MOUNTING

Problems of field adjustment or replacement are easy on the Koehring gasoline crane with multi-plane mounting. Heavy-duty construction forestalls replacement and adjustments in the field, and when necessary the simplicity of construction, accessibility, and interchangeability of parts, make the work easy. Bulletin Cr-6 issued by the Koehring Co., Milwaukee, Wis., describes this crane completely.

TRACTOR SNOW PLOWS

The exclusive features of the LaPlant-Choate tractor snow plows for removing snow from either city streets or country roads quickly, economically, and efficiently, are told in Catalog M recently issued by the La Plant-Choate Mfg. Co., Cedar Rapids, Iowa.

A NEW FOUR-CYLINDER 10-12-HORSEPOWER ENGINE

The LeRoi Co., Milwaukee, Wis., has recently announced its new Model K light-weight, smooth-running four-cylinder, 10- to 12-horsepower engine. This unit is described in literature which may be secured from the manufacturer.

ALUMINUM RULES IN TENTHS AND HUNDREDTHS OF FEET

Lufkin aluminum rules for civil engineers, surveyors, highway builders, tile layers and others, which are accurate, lightweight, durable, and rough-proof, are described in the literature of the Lufkin Rule Co., Saginaw, Mich.

AN ENGINE THAT DELIVERS FULL POWER

The Beaver engine which is preferred by many contractors and manufacturers for heavy-duty work and which is of the valve-in-the-head design with oversize working parts, is described completely in a bulletin which may be secured from the Beaver Mfg. Co., 50 25th Street, Milwaukee, Wis.

SHORT CUTS TO PROFIT WITH TRACTORS

Caterpillar tractors which supply the power and traction for the many "short cuts" of resourceful earth-movers working in unfavorable weather, always cutting costs and increasing profits, are described in the latest literature of the Caterpillar Tractor Co., San Leandro, Calif.

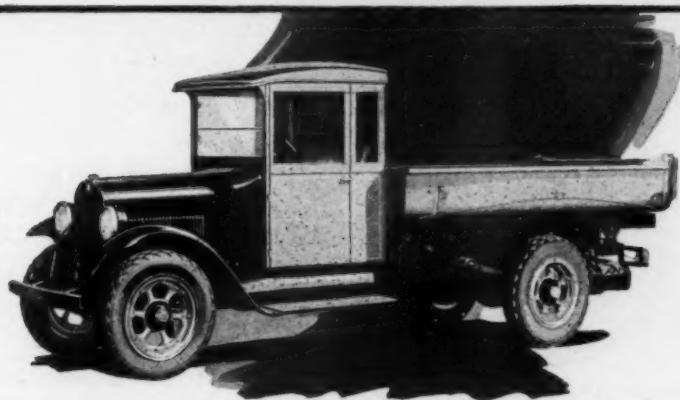
HAND BUSH-HAMMERS

Descriptive matter on hand bush-hammers in a size for every bushing and dressing job on concrete, as well as on the complete Dallett line of pneumatic tools and chisel equipment for bushing concrete and finishing cast stone, including hand points and chisels, hand and striking hammers, drill bits and hollow steels, may be secured from The Dallett Co., Broad and Federal Streets, Philadelphia, Pa.

A LUBRICANT FOR HEAVY-DUTY MACHINERY

Information regarding "D-A" lubricant, which is a densified Pennsylvania oil especially adapted for use on heavy-duty machinery, may be secured on request from the D-A Lubricant Co., Indianapolis, Ind.

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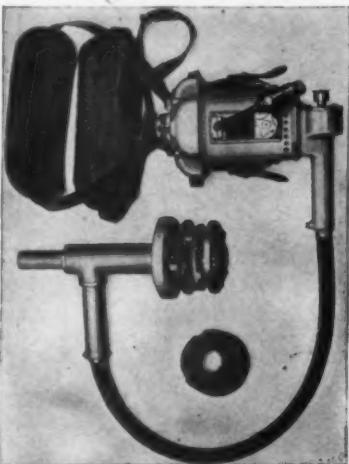
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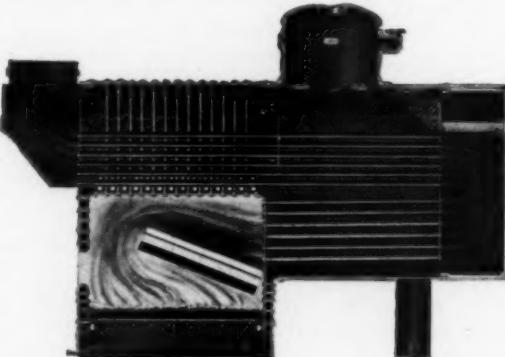
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Unit block and crankcase keep bearings in permanent alignment.
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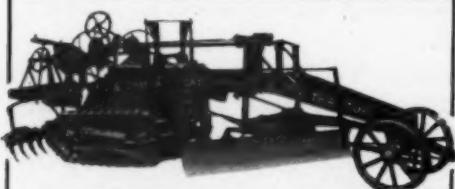
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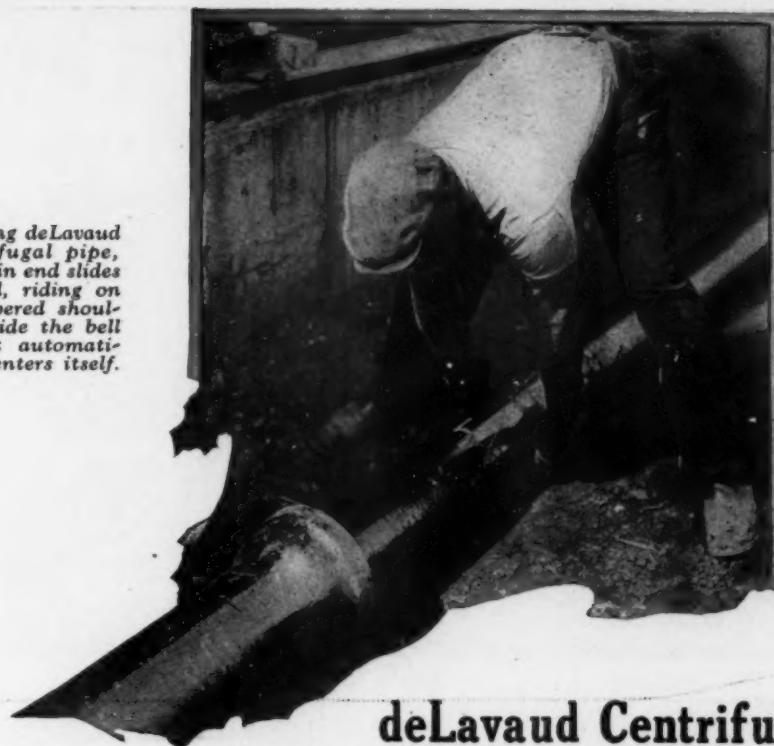
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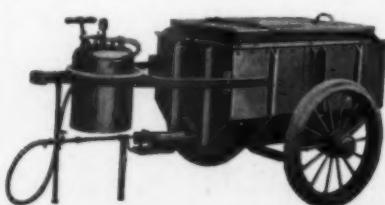
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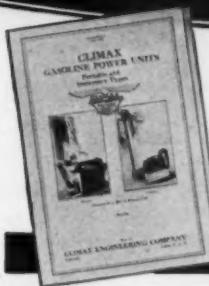
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See this Koppel Car—you will like it.

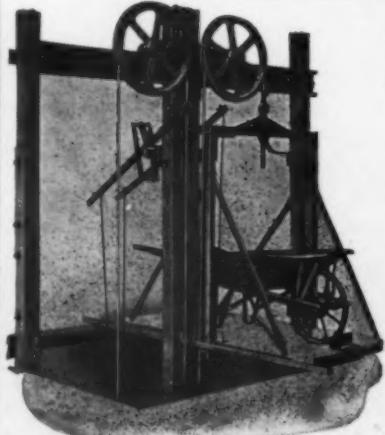
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The Zetterlund Automatic Hoist saves the wages of an operator. The wheelers operate the Hoist from the discharge level, operating the control lever just as easily and simply as signaling an operator. The Hoist stops automatically at the floor level.

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Heavy duty power—the kind that's quick to respond and keeps going every minute. That's the Beaver Engine. And exactly why the Beaver is used so frequently on industrial locomotives. It takes good, steep grades with overloads and furnishes smooth running and economical power.

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Beaver Engines furnish dependable power to all types of heavy-duty construction equipment: tractors, pavers, excavators, power shovels, hoists, and the like. When you buy such equipment, look for the Beaver—it is an assurance of reliable performance.

The Beaver is made in sizes ranging from 25- to 150-H.P. Write for bulletin describing Beavers in detail.

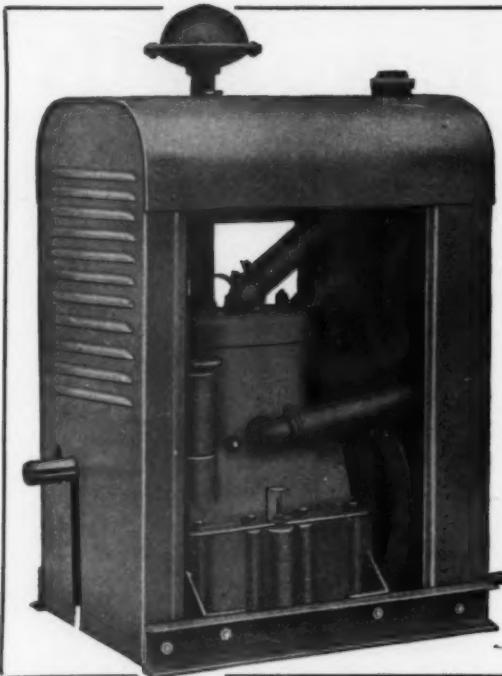
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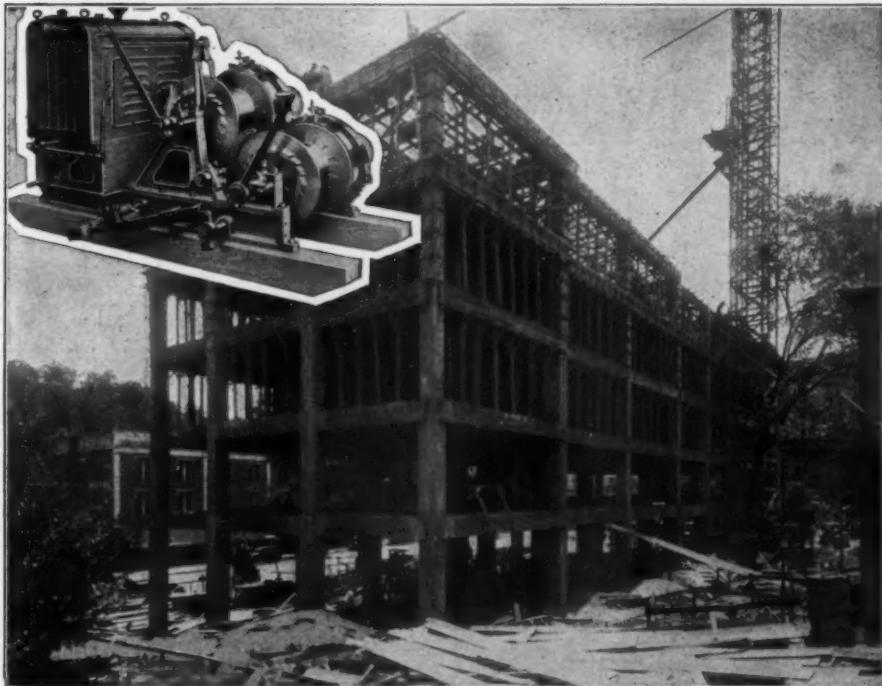
CLYDE

Standard Hoists and Derricks
For the General Contractor
STEAM · ELECTRIC · GASOLINE · BELT

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The Plaster Mix

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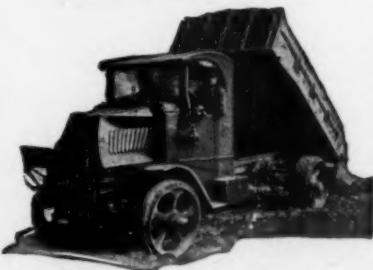
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— that's the actual averaged yearly repair part cost per unit of all Le Roi engines in concrete mixer service. This figure is authentic and covers a four year period.

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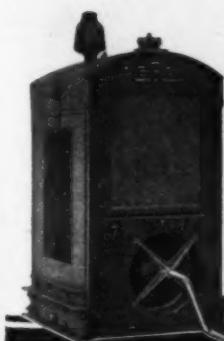
Therefore it's not surprising that Le Roi so highly "towers" its field. Actual performance and low repair cost charts bear witness to Le Roi's enviable position.

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Look to the Le Roi for dependable power and know it by what it does.

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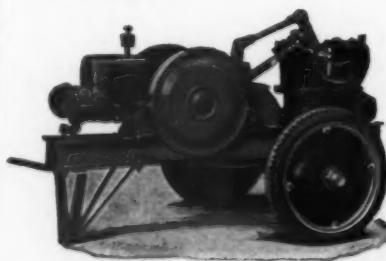
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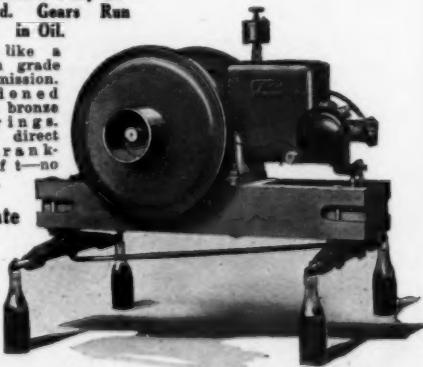
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The Jack is Fully Enclosed. Gears Run in Oil.

Built like a high grade transmission. Hardened gears, bronze bearings. Drives direct from crank-shaft—no chains.



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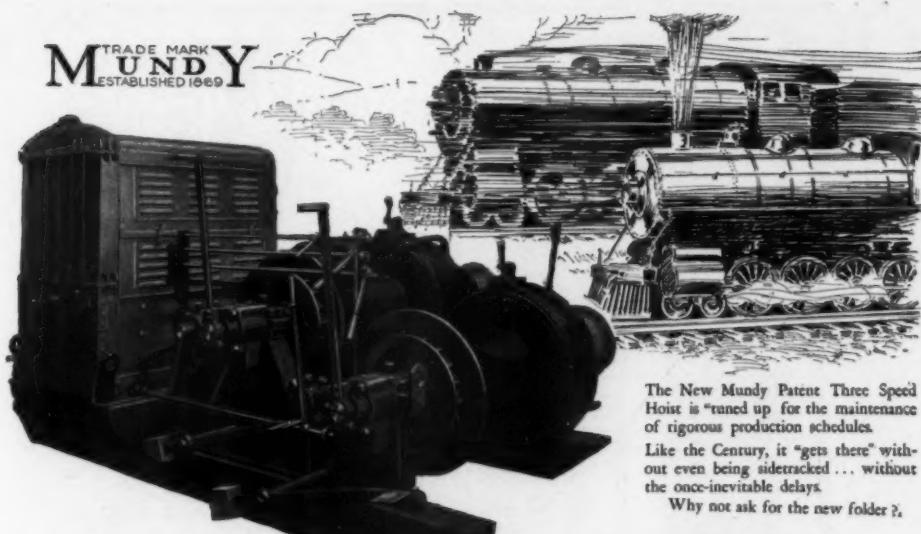
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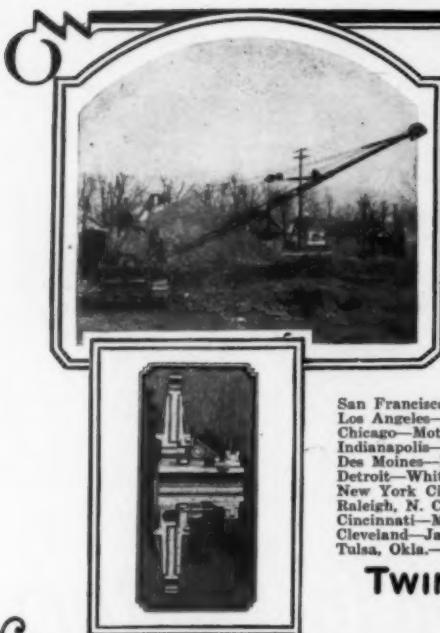
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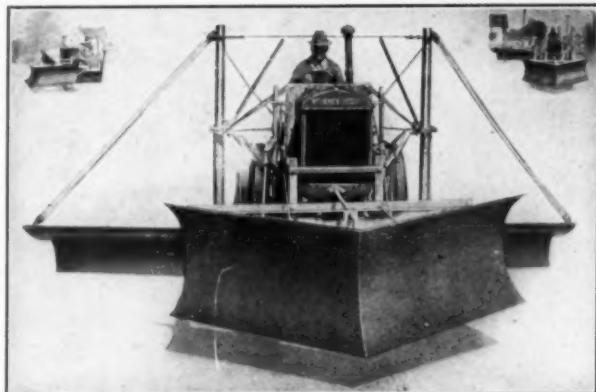


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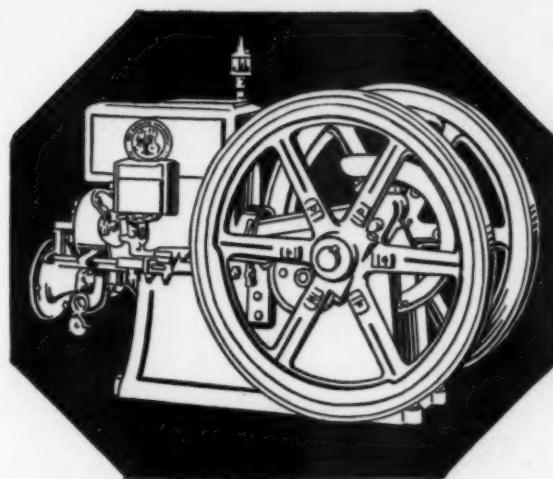
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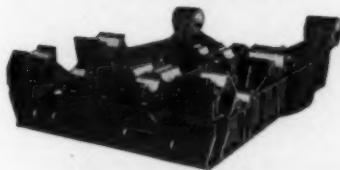
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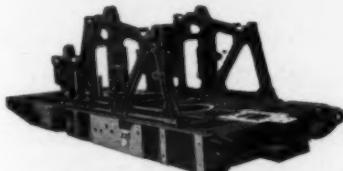
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is largest of its size that ships on flat car without dismantling. Saves time and money.

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Less dead weight to be lifted—greater strength.

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*Send for the Heil Catalog and Pricelist.
Bulletin 160 will be sent on your request.*

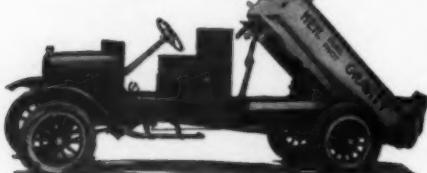
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One of our Twenty-five Distributors
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Mfrs. of Steel Dump Bodies, Hoists, and
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This is the new model 105 Heil Dual Pivot Gravity Dump Body for mounting on the Ford and other light weight trucks. It has a capacity of 1 cu. yd. which can be readily increased to 1 1/2 cu. yds. carried in stock ready for immediate delivery.

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the New **BELLE CITY** **BUILT** **MODEL E**

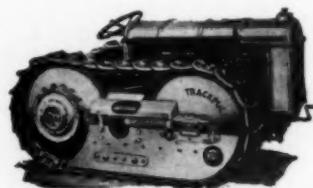
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Automatic Spring Release and Front Spring suspension absorbs shocks and strains and prevents injury to working parts.

All working parts and adjustments easily accessible.

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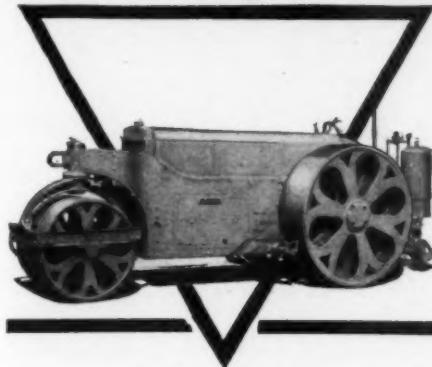
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More dependable and less trouble—That's Huber Road Roller Economy.

The Huber 4-Cylinder Motor Roller effects great savings in road construction and maintenance. Its speed and absolute dependability enable contractors to get out twice the amount of work in the same period of time. The result can be nothing but increased profits.

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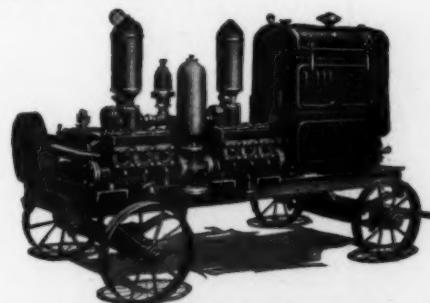
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TRIPLEX PUMP UNITS

60, 70 and 80 gallons per minute high pressure pumps for the road builder.



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200 and 300 gallons per minute pumps for pile jetting.

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Interchangeable Mountings

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"D-A" Lubricant

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that are strong—
that can be used over and over
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that are easy to place on any
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that are easy to take off any
column—
that save labor—
that are easy to store—
that fit any shape column—

THE W. A. K.

Column Clamps
Many Ohio contractors are now cutting costs by the use of these clamps.

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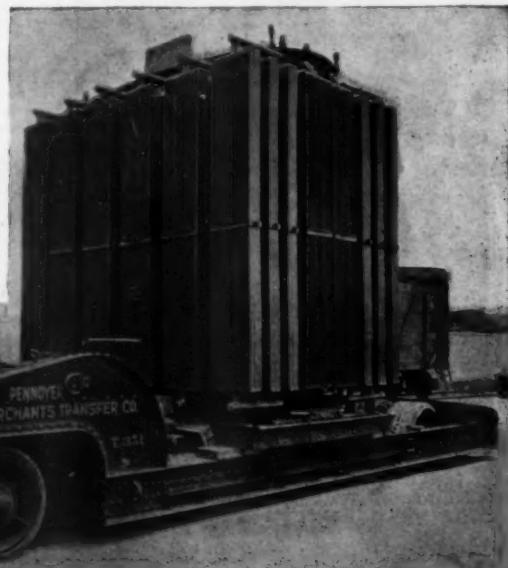
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Also two-, four-, and eight-wheel types for all construction requirements.

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The EVERHOT Branding Torch permanently marks your tools and your equipment.

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have bodies with round bottoms, and are easy to dump. Durably constructed in every detail.

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ON THE MARKET SINCE 1921

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Easy control from driver's seat while
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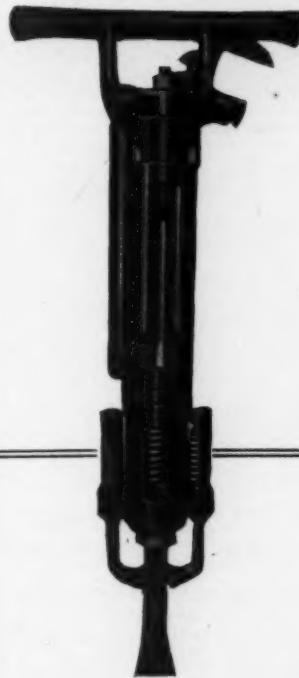


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**CUTS THE COST
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Low upkeep cost—
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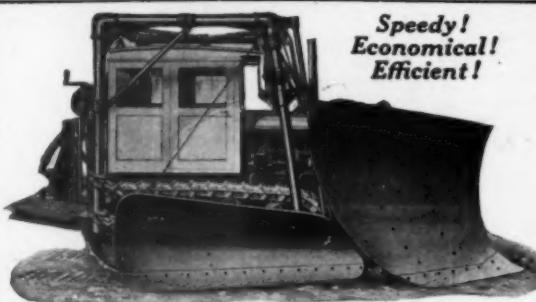
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A Hotchkiss Development

for the

Construction of Concrete Roads, Walks, Curbs, and Gutters, Drives, Building Foundations, etc., and All Sizes of Each.

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Binghamton, N. Y.

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UNION IRON WORKS

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West Shore Siding Hoboken, N. J.

Model 6630, Built Especially for Ford One-Ton Truck



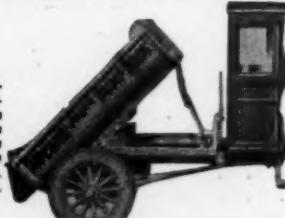
Superior Automatic Dump Body

GENERAL SPECIFICATIONS

Capacity (water level).....	13 cu. yds.
Capacity gained by side boards.....	1 cu. yd.
Length.....	66 inches
Width.....	48 inches
Depth.....	10½ inches
>Loading Height from ground.....	52 inches
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Ground clearance in dumping position, 7½ in.	

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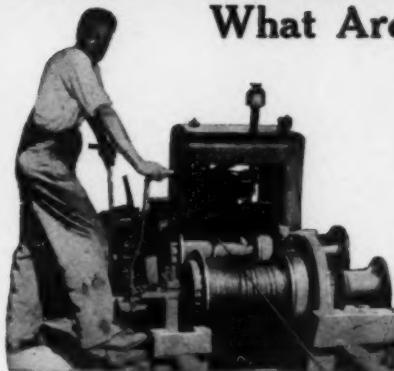


SUPERIOR BODY CORPORATION, Marion, Indiana

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Asbestos-Lined Frictions and Brakes
Machined and Bronze Bushed Drums
Second unit easily operated
Gasoline or electric motor

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Handi-Hoists give you a rope pull of 2500 lbs. at 175 ft. per minute. Handi-Hoists owned by the St. Clair Supply Co., Greensburg, Pennsylvania, operate skip car unloaders at a speed that unloads two 55-ton cars of gravel in 42 minutes.

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ECONOMY?

On Dutton's job the average number of piles driven was 23 per day. Average gas consumption was only 5½ gallons!

PORTABILITY?

The Handi-Hoist, single-drum or double-drum, weighs from 1500 to 3200 lbs. Easily snaked about on the job and moved to new locations by truck. Martin & Breen, Inc., Philadelphia contractors, find that their Handi-Hoist not only operates their light derricks efficiently but that the latter outfit can be delivered on the job, erected, taken down and returned to the yard for one-third the cost of handling the usual heavier steam-operated outfit.

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Canadian Factory: Welland, Ontario
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With or without Scarifier
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on time.



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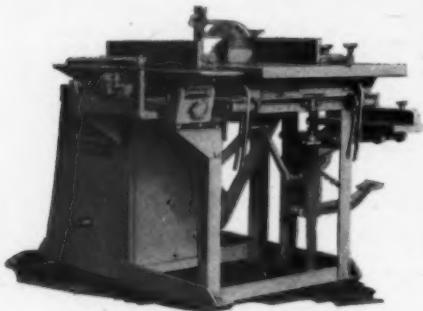


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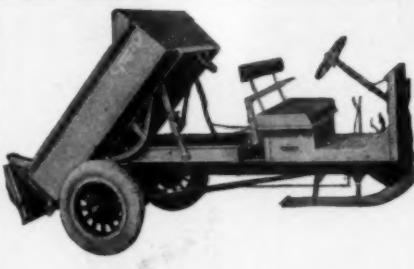
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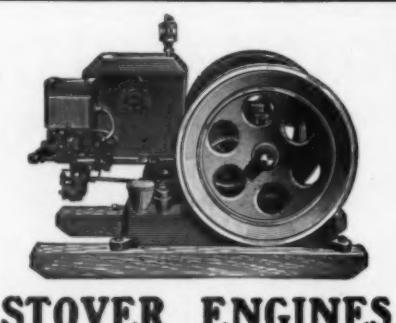
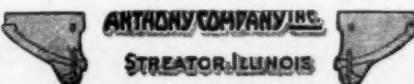
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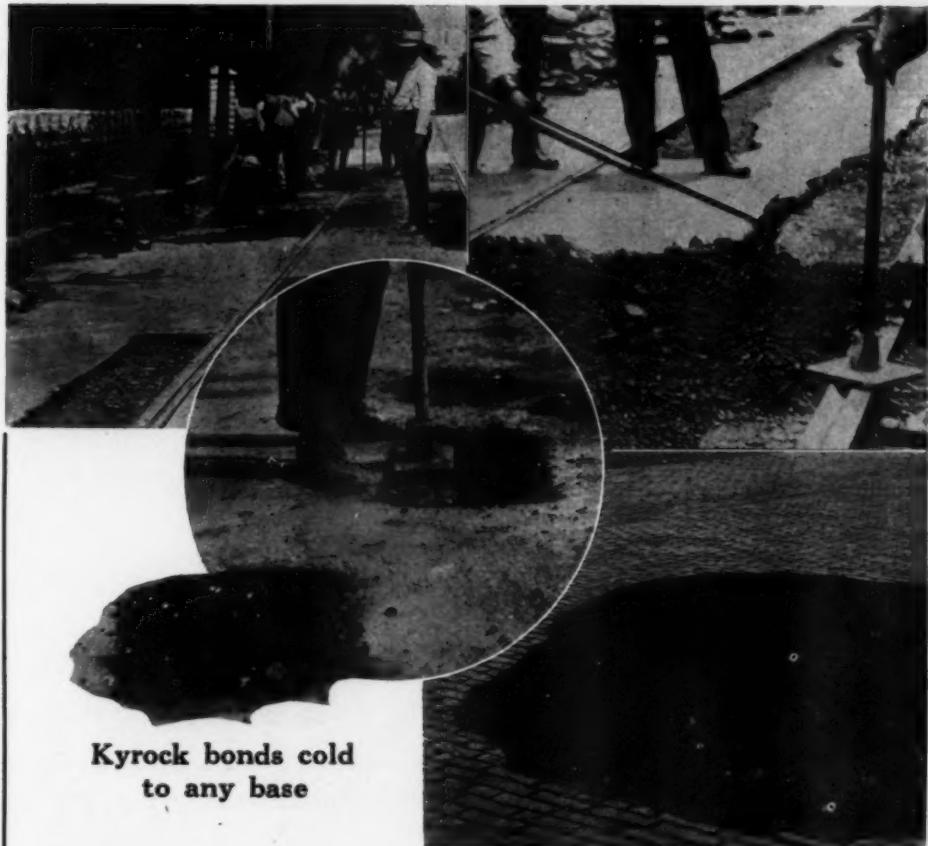
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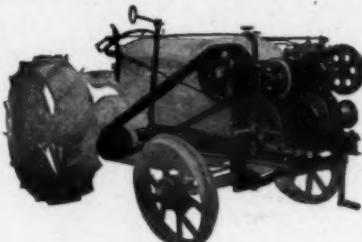
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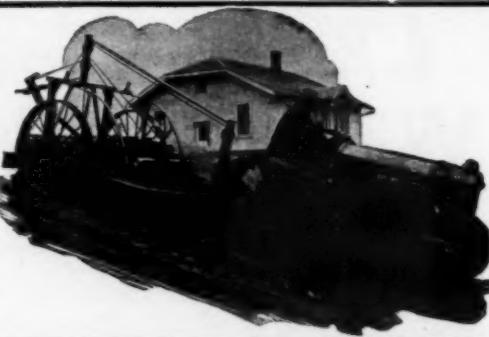
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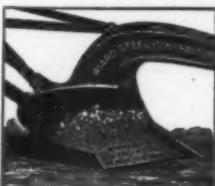
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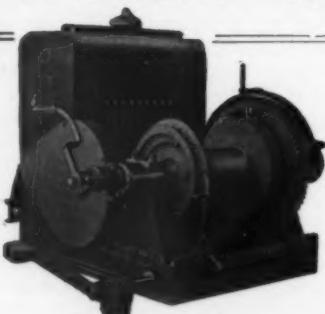
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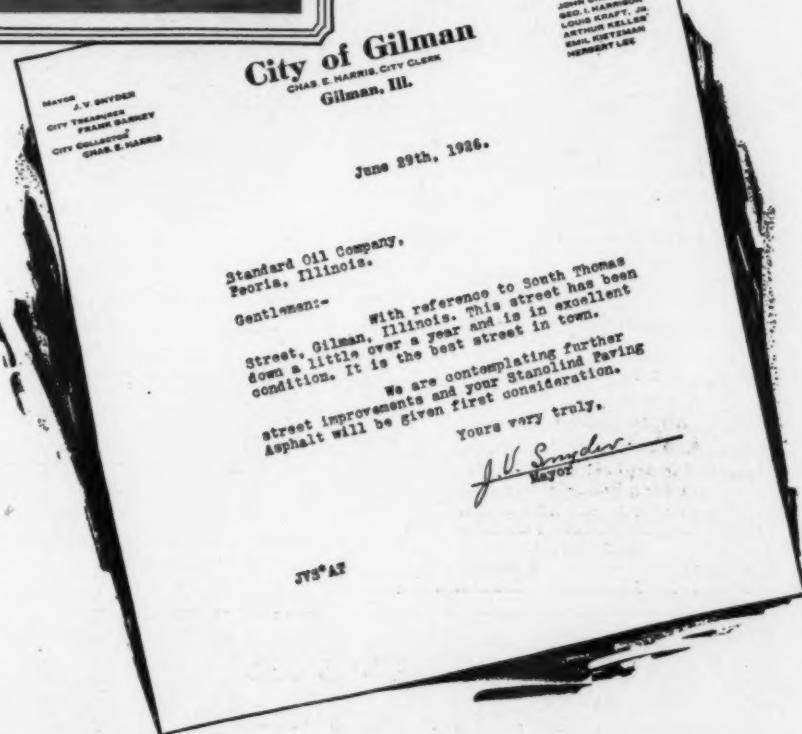
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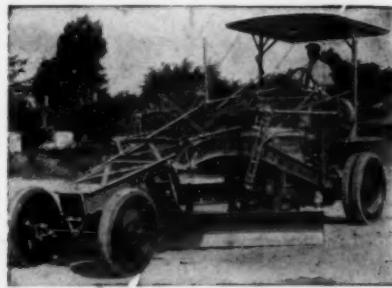
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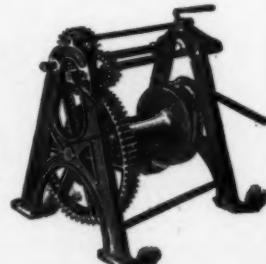


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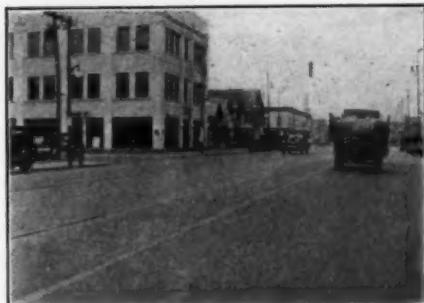
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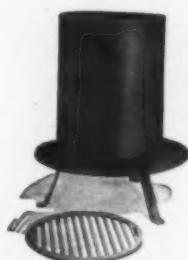
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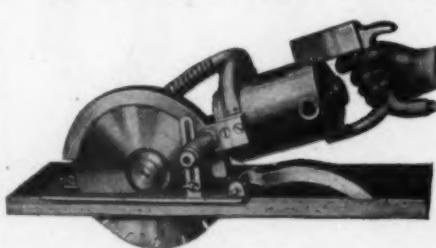
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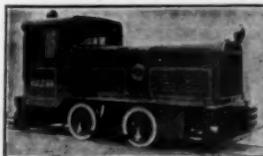


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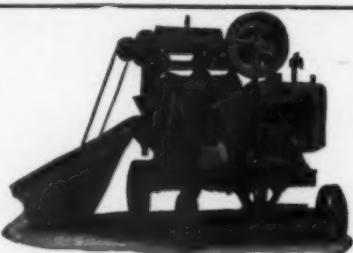
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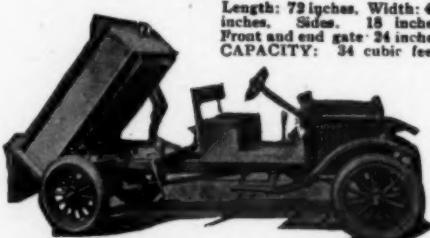
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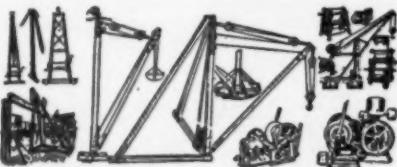
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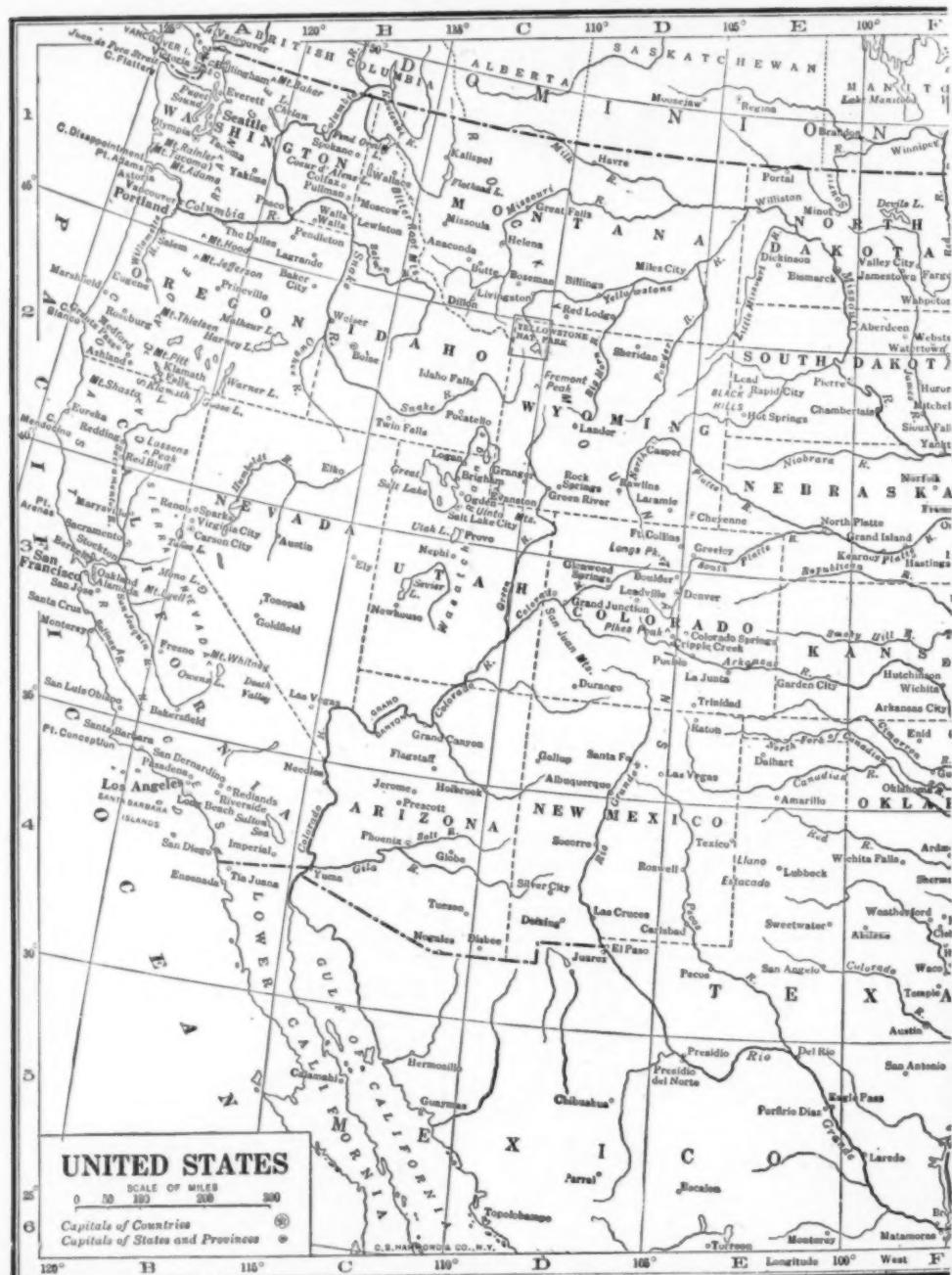
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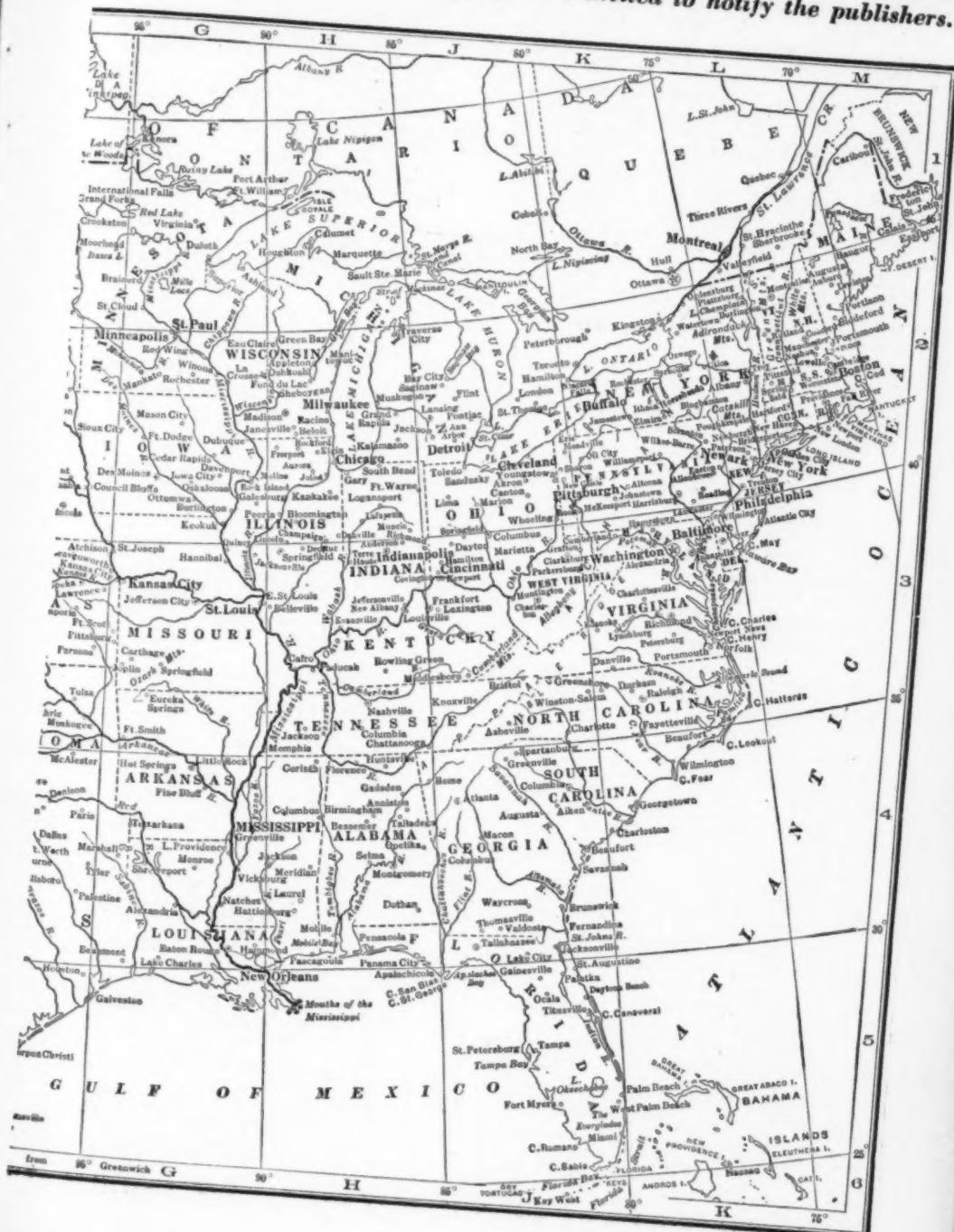
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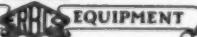
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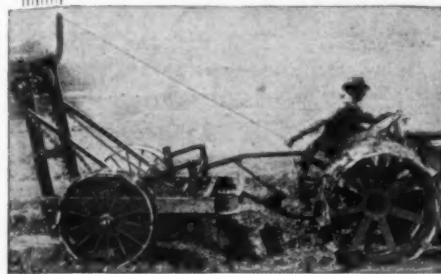
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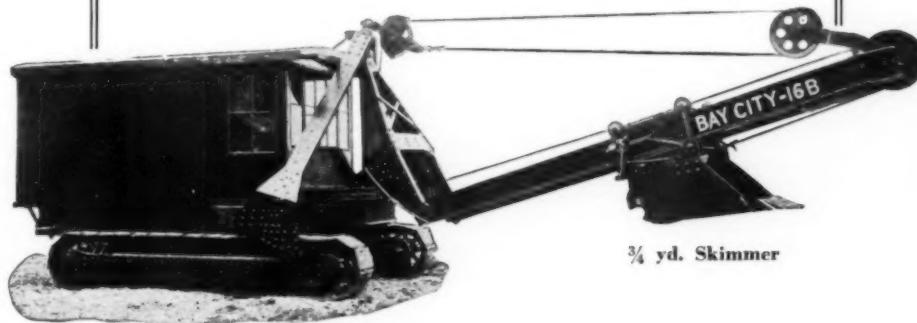
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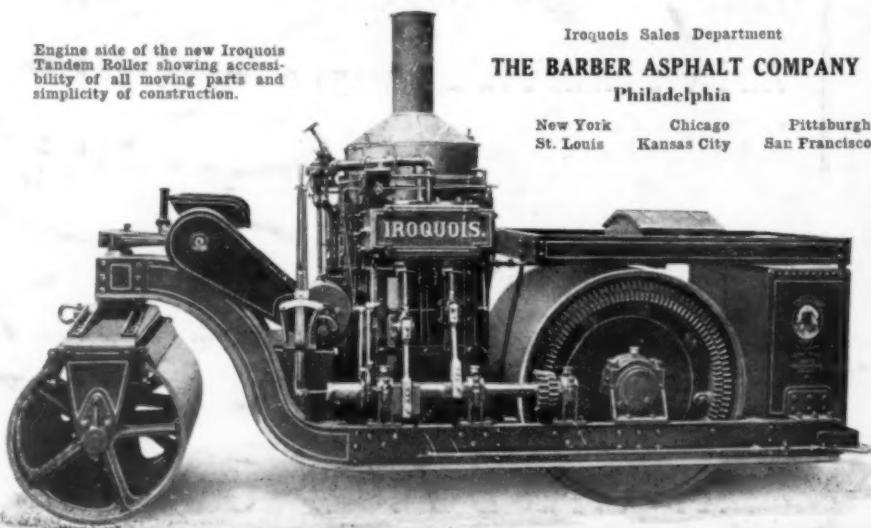
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